

THE
Tea Research Institute
OF
Ceylon

BULLETIN No. 34

Annual Report for the Year
1952



Published by
THE TEA RESEARCH INSTITUTE OF CEYLON
ST. COOMBS, TALAWAKELLE, CEYLON,

1954.



The Tea Research Institute of Ceylon

STAFF

DIRECTOR ... J. Lamb, M.Sc. (Lond.), F.R.I.C.,
A.I.C.T.A.

Chemical Division

Biochemist ... J. Lamb, M.Sc., (Lond.), F.R.I.C.,
A.I.C.T.A.

Agricultural Chemist ... F. Haworth, B.Sc., Ph.D., (Liv.), Dip.
Agric. (Cantab.).

Technologist ... E. L. Keegel

Research Assistant to Biochemist ... M. S. Ramaswamy, B.Sc., (Mysore),
A.R.I.C., A.I.I.Sc.

Assistants ... E. N. Perera, V. Mendis & S. M. Gunaratnam.

Plant Physiology Department

Plant Physiologist & Deputy Director ... G. B. Portsmouth, B.Sc., (Lond.),

Research Assistant ... A.R.C.S., D.I.C.

Assistants ... F. H. Kehl

... M. Piyasena & E. S. Rajiah

Pathology Department

Pathologist ... C. A. Loos, F.L.S., M.I. Biol.

Mycologist ... B. N. Webster, M.A., (Cantab.), M.Sc.,
(Nottm.) M. I. Biol.

Assistant Pathologist ... G. D. Austin

Assistants ... D. J. W. Ranaweera, H. L. Munasinghe
& M. K. Vythialingam

Engineering Department

Engineer ... J. Landreth, A.M.I.B.A.E., Member
A.S.A.E.

St. Coombs Estate

Superintendent ... F. C. Daniel

Low-Country Sub-Station

Scientific Officer ... T. E. Walter, B.Sc., (Edin.)

Assistant ... F. P. Jayawardana

Administration

Secretary ... G. A. D. Kehl

Secretary to the Director ... A. C. Perera

Asst. Secretary/Librarian ... G. Mason, B.A., (Lond.)

Accounts Clerk ... A. H. B. Dias

Stenographers ... F. G. D. Sielvie & M. Neydorff

Asst. Clerks ... K. A. Salaam & R. L. A. Dissanayake

Small Holdings Advisory Service

Officer-in-Charge ... R. L. Illankoon

Tea Small Holdings Officers ... W. T. Fonseka, K. P. Abeywickreme,
M. V. de Silva & K. de A. Kulasekera

NOTE

The laboratories of the Institute are situated at St. Coombs Estate, Talawakelle, and letters and enquiries should be addressed to the Director, Tea Research Institute of Ceylon, St. Coombs, Talawakelle, Telegraphic Address:—Research, Talawakelle, Telephone, Talawakelle 44 (Private Exchange). It is particularly requested that letters should not be addressed to Officers by name.

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TWENTY-SEVENTH ANNUAL REPORT OF THE BOARD OF THE TEA RESEARCH INSTITUTE OF CEYLON FOR THE YEAR 1952.

Foundation. The Tea Research Institute of Ceylon was established by Ordinance No. 12 of 1925 dated 27th October, 1925.

The personnel constituting the Board of Control is laid down in the above Ordinance and in the Tea Research (Amendment) Act No. 24 of 1948 dated 20th October, 1948.

The members of the Board on the 1st day of January, 1952 were:—

Ex-officio Members

The Director of Agriculture (Dr. A. W. R. Joachim, M.B.E.)
The Hon'ble the Minister of Finance (Represented by Mr. A. G. Rana-
singha, C.M.G., C.B.E., C.C.S. Secretary to the Treasury)
The Chairman, Planters' Association of Ceylon (Mr. R. C. L. Notley)
The Chairman, Agency Section, Planters' Association of Ceylon (Mr. R.
S. Davies.)

Representatives of the Planters' Association of Ceylon

Mr. R. C. Scott, C.B.E.
Mr. H. S. Hurst.
Mr. H. de T. Wilkinson Kay.

Representatives of the Agency Section, Planters' Association of Ceylon

Mr. W. H. Attfield.
Mr. R. M. Macintyre.
Mr. A. D. McLeod.

Representatives of the Low-Country Products Association

Mr. W. Neal de Alwis, M.P.
Mr. Errol Jayawickreme, J.P., U.M.
Mr. D. E. Hettiarachchi, J.P., U.M.

Representative of the Small Holders

Mr. V. G. W. Ratnayake, M.B.E., M.P.

<i>Chairman:</i>	Mr. R. C. Scott, C.B.E. Mr. H. S. Hurst Acting 5th May, 1952 to 20th November, 1952.
<i>Secretary:</i>	Mr. J. Lamb, M.Sc.
<i>Solicitors:</i>	Messrs. Julius & Creasy.
<i>Auditors:</i>	Messrs. Ford, Rhodes, Thornton & Co.
<i>Registered office:</i>	St. Coombs, Talawakelle.

The following changes in the personnel of the Board were recorded during the year:

Ex-officio Members.

Mr. W. H. Gourlay, Chairman, Agency Section, Planters' Association of Ceylon vice Mr. R. S. Davies as from 22nd February, 1952.

Mr. W. R. Vander Kiste, Chairman, Planters' Association of Ceylon vice Mr. R. C. L. Notley as from 28th March, 1952.

Representatives of the Planters' Association of Ceylon.

Mr. R. J. S. Bean (Acting) vice Mr. R. C. Scott (on leave) as from 5th May, 1952 to 20th November, 1952.

Mr. A. J. Dickson vice Mr. H. de T. Wilkinson Kay as from 1st July 1952.

Representatives of the Agency Section of the Planters' Association of Ceylon.

Mr. G. K. Newton vice Mr. R. M. Macintyre as from 31st January, 1952. Mr. G. J. Harris vice Mr. W. H. Attfield as from 4th March, 1952. Mr. L. F. J. Smith (Acting) vice Mr. A. D. McLeod (on leave) as from 24th April, 1952 to 23rd October, 1952.

Four meetings of the Board were held during the year *via*: on 1st March, 18th July, 21st November and 19th December.

The meeting of 1st March, 1952, was held at St. Coombs and the rest in Colombo.

Committees. *Finance Sub-Committee.* The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.); The Chairman, Planters' Association of Ceylon (Mr. R. C. L. Notley); The Chairman, Agency Section of the Planters' Association of Ceylon (Mr. R. S. Davies); Messrs W. H. Attfield, H. S. Hurst, Dr. A. W. R. Joachim, M.B.E., and the Director & Secretary (Mr. J. Lamb).

The following changes in the membership of the Committee were recorded during the year:

Mr. W. H. Gourlay (Chairman, Agency Section, Planters' Association of Ceylon) vice Mr. R. S. Davies as from 22nd February, 1952.

Mr. W. R. Vander Kiste (Chairman, Planters' Association of Ceylon) vice Mr. R. C. L. Notley as from 28th March, 1952.

Mr. Errol Jayawickreme, J.P., U.M. (Acting) vice Mr. R. C. Scott, C.B.E. (on leave) as from 18th July, 1952, to 20th November, 1952.

Mr. A. D. McLeod vice Mr. W. H. Attfield, as from 21st November, 1952.

One meeting of the Committee was held during the year on the 19th December.

Estate and Experimental Sub-Committee. Chairman, The Director, Tea Research Institute of Ceylon (Mr. J. Lamb); Mr. R. C. Scott, C.B.E. (Chairman, Tea Research Institute of Ceylon); Mr. A. H. Hall (Visiting Agent, St. Coombs); Mr. F. C. Daniel (Superintendent, St. Coombs); Messrs. S. Bolster, H. S. Hurst, T. Kane, S. P. Vythilingam and R. Leaning. Dr. F. Haworth (Agricultural Chemist) acted as Convener.

Changes in the personnel of the Committee during the year were:—

Mr. G. K. Newton (Visiting Agent, St. Coombs) vice the late Mr. A. H. Hall as from 1st March, 1952.

Messrs. D. E. Hettiarachchi and R. J. S. Bean as representatives of the Low Country Districts as from 18th July, 1952.

Mr. A. J. Dickson as representative of the Uva District as from 18th July, 1952.

Mr. B. N. Webster (Mycologist) was appointed Convener vice Dr. F. Haworth as from 6th December, 1952.

Meetings of the Sub-Committee were held on 23rd February, 21st June, 18th October and 6th December.

Low-Country Sub-Station Sub-Committee. Messrs. R. C. Scott, C.B.E., (Chairman, Tea Research Institute of Ceylon), V. G. W. Ratnayake, M.B.E., M.P., W. Neal de Alwis, M.P., Leo B. de Mel, J.P., U.M., Dr. A. W. R. Joachim M.B.E., and Mr. J. Lamb (Director, Tea Research Institute).

Small Holding Sub-Committee. Mr. V. G. W. Ratnayake, M.B.E., M.P., (Chairman); Dr. A. W. R. Joachim, M.B.E., Mr. W. Neal de Alwis, M.P., Mr. J. Lamb (Director, Tea Research Institute of Ceylon); and Mr. R. L. Illankoon (Officer in charge, Small Holdings Advisory Service) Convenor.

The Committee held three meetings during the year, *viz.* on 29th February, 1st September and 20th November.

Trustees—T.R.I. Junior Staff Provident Fund. The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.); The Director, Tea Research Institute of Ceylon (Mr. J. Lamb); Mr. V. G. W. Ratnayake, M.B.E., M.P., representing the Board of the Tea Research Institute of Ceylon and Mr. E. N. Perera representing the Junior Staff.

Committee of Management—T.R.I. Junior Staff Medical Fund. The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.,—Mr. H. S. Hurst, Acting from 5th May 1952 to 20th November, 1952); The Director, Tea Research Institute of Ceylon (Mr. J. Lamb), and Mr. G. D. Austin representing the Junior Staff.

Visiting Agent. Mr. G. K. Newton was appointed Visiting Agent for St. Coombs on 1st March, 1952. He paid three visits during the year, *viz.* on 4th to 6th April, 2nd to 3rd August and 4th to 5th December.

Finance. Receipts for the year totalled Rs. 824,868. The Tea Cess amounted to Rs. 786,005 an increase of Rs. 25,375. against that collected in 1951. This increase was however offset by a decrease in the profit from the year's working of St. Coombs Estate by Rs. 33,233. Total receipts for the year 1952 was less than that for the previous year by Rs. 7,044.

Expenditure on Revenue Account amounted to Rs. 737,147 as against Rs. 660,406 in 1951, and comprised Rs. 672,443. on Research Revenue Account Rs. 6,718 interest on Government Loan Account and Rs. 57,986 on Depreciation Account.

The surplus in the year's working account was therefore Rs. 87,721 as compared with Rs. 171,506 in 1951.

Capital Expenditure totalled Rs. 238,332 made up of Rs. 170,565. on Assets and Rs. 67,767 on Government of Ceylon Loan Repayment Account. Buildings and Lines Rs. 124,492. Land Development Rs. 21,632. and Furniture and Equipment Rs. 13,187 were the chief items of expenditure on Assets.

The value of net liquid Assets at 31st December, 1952, after allowing for liabilities on Furlough Pay & Passages Reserve, Small Holdings Advisory Service and Blister Blight Accounts was Rs. 203,638, which represented only 23% of the total Depreciation Reserve of Rs. 868,196.

The balance outstanding on the Government of Ceylon Loan Account at 31st December, 1951 was Rs. 71,392.

Small Holdings Advisory Service. Cess collections for the year amounted to Rs. 157,200. This sum together with the grant from the Institute's funds of Rs. 45,000 and the 1951 balance of Rs. 38,838. brought the total receipts for the year to Rs. 241,038.

Expenditure totalled Rs. 170,807. *viz.* Rs. 148,558. on Revenue Account and Rs. 22,249. on Capital Account. There was therefore a surplus of Rs. 70,231. to be carried forward.

St. Coombs Estate. 1952 was a very successful year for the estate for both the total crop harvested, *viz.* 267, 974 lbs. and the yield per acre, *viz.* 952 lbs. were all time records. The profit from the year's working however fell far short of the previous year's figure of Rs. 63,915 as well as the average for the period 1929 - 1951. A rise in the cost of production together with a slight drop in the selling price of the tea accounted for the decrease in the profit which was Rs. 30,682. for the year.

Publications. All four parts of Vol. XXIII of the "Tea Quarterly" were published in 1952. There was little or no lag behind publication dates. The Annual Report for 1950, *viz.* Bulletin No. 32 was also published during the year.

Receipts from sales of publications amounted to Rs. 5,270, and from advertisements to Rs. 3,125. The total cost of printing and distribution was Rs. 23,297.

Acknowledgments. The fullest co-operation was, as usual, received from the Ceylon Association in London, the Planters' Association of Ceylon, the Agency Section of the Planters' Association of Ceylon, numerous Agency Houses, Engineering Firms and other bodies concerned with the Tea Industry. The grateful thanks of the Board are due to all of them for their help and encouragement.

Thanks are also due to the Planters' Association of Ceylon for the readiness with which their room was placed at the disposal of the Board for meetings of the Board and its Committee during the year.

Accounts. Messrs. Ford, Rhodes, Thornton & Co. continued to act as Auditors. The audited statement of accounts and the Balance Sheet for 1951 follow this report as also do the reports on St. Coombs Estate, and of the Director and Scientific Staff.

J. LAMB,
Secretary.

Tea Research Institute of Ceylon,
St. Coombs, Talawakelle.

THE TEA RESEARCH INSTITUTE OF CEYLON.

BALANCE SHEET AS AT 31st DECEMBER, 1952.

[illegible]

THE TEA RESEARCH INSTITUTE OF CEYLON.

CAPITAL EXPENDITURE ACCOUNT AS AT 31st DECEMBER, 1952.

	As at 31-12-51	Additions in 1952	Items Scrapped and Sold	As at 31-12-52
	Rs. cts.	Rs. cts.	Rs. cts.	Rs. cts.
LAND INCLUDING DEVELOPMENT	978,078.12	21,631.61	—	999,709.73
LIBRARY STEEL SHELVING	—	1,093.37	—	1,093.37
BUILDINGS AND LINES	1,434,199.70	124,491.97	1,236.82	1,557,454.85
FURNITURE AND EQUIPMENT	121,404.21	13,186.62	—	134,590.83
LABORATORY AND EQUIPMENT	61,911.62	2,126.96	—	64,038.58
EXPERIMENTAL MACHINERY	39,334.09	1,369.61	—	40,703.70
MOTOR ROAD ROLLER	7,386.03	—	—	7,386.03
MOTOR CAR	9,995.00	—	—	9,995.00
MACHINERY—ESTATE	163,905.90	—	7,413.43	156,492.47
HOIST	2,055.38	—	—	2,055.38
STATION WAGON	11,500.00	—	—	11,500.00
ATCO MOTOR MOWER	650.00	—	—	650.00
LOW COUNTRY SUB-STATION	80,927.72	3,024.12	415.80	83,536.04
GRUBBER	2,534.77	—	—	2,534.77
SMALL HOLDINGS ADVISORY SERVICE LAND ROVER	10,000.00	—	10,000.00	—
TRAILER CAP	—	3,640.92	—	3,640.92
	Rs. 2,923,882.54	Rs. 170,565.18	Rs. 19,066.05	Rs. 3,075,381.67

THE TEA RESEARCH INSTITUTE OF CEYLON.

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ESTATE WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1952.

EXPENDITURE		1951		Rs.		Cts.		Rs.		Cts.	
ESTATE EXPENDITURE—REVENUE		Rs.		Cts.		Rs.		Cts.		Rs.	
General Charges		107,215		89,991.36		509,388		256,047 lbs.		509,701.72	
Upkeep		98,240		109,052.30		3,020		1,134 lbs.		2,173.41	
Cultivation		41,391		61,664.30		3,583		8,985 lbs.		3,825.35	
Harvesting		101,995		112,078.56		402		280 lbs.		520.66	
Manufacture		96,197		105,841.11		—		1,528 lbs.			
Colombo brokerage and handling charges		7,640		7,114.83		200		267,974 lbs.		516,221.14	
Balance carried down		63,915		30,682.13						203.45	

Rs. 516,593	Rs. 516,424.59	Rs. 516,424.59
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INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1952.

1951	Rs.	Rs.	Cts.	Rs.	Cts.	1951	Rs.	Rs.	Cts.
ADMINISTRATION OF THE BOARD									
240	4,684	26,235	1,637	1,733	825	3,171	29	1,260	—
Planters' Association of Ceylon									
Travelling of the Board									
Clerical Staff Salaries									
Telephone Operators									
Office Peon									
Postages									
Stationery									
Advertising									
Telegrams and trunk calls									
Printing									
Legal expenses									
2,480	322	15,170	180	596	—	—	—	—	—
Audit fees and expenses									
Contingencies									
Dearness Allowance									
Administrative Secretary									
Cooly allowance									
58,562									
Carried forward									
Rs. 824,867.95									
Carried forward									
Rs. 831,913									
Balance brought down									
Tea Cess									
Less: credited to Small Holdings Advisory Service account									
Interest									
Rent of Cadday									
Guest House									
Miscellaneous receipts									
Rs. cts.									
30,682.13									
786,004.75									
7,083.13									
600.00									
244.25									
253.69									
943,204.86									
157,200.11									

THE TEA RESEARCH INSTITUTE OF CEYLON.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1952.—(contd.)

1951 Rs.	PERSONAL EMOLUMENTS OF SCIENTIFIC STAFF	Brought forward	Rs.	Cts.	1951 Rs.	B/f	Brought forward	Rs.	Cts.
29,642	Director		30,000.00						
325	Director's peon allowance		1,006.40						
2,400	Allowance to acting Director		8,034.35						
4,820	Servants' allowance to staff		22,529.62						
21,000	Plant Physiologist		17,797.55						
16,080	Agricultural chemist		13,300.00						
12,700	Scientific Officer		17,175.34						
6,238	Pathologist		13,000.00						
—	Mycologist		—						
13,880	Assistant Pathologist		4,999.92						
4,248	Proportion of Superintendent's salary		32,402.75						
27,689	Dearness allowance		1,800.00						
1,800	Deputy Director's allowance		3,720.00						
3,660	T. E. Walter—car & special allowance		8,612.00						
2,584	Tea Technologist		—						
147,066					174,377.93				
	EMOLUMENTS TO JUNIOR & SUB-SCIENTIFIC STAFF								
65,809	Junior Scientific staff		59,470.59						
10,675	Laboratory attendants & Fieldmen		11,318.72						
36,199	Dearness allowance		33,338.65						
112,683					104,127.96				
	LABORATORY								
7,348	Equipment & general working expenses		13,384.12						
26	Furniture & office equipment		—						
7,374					13,384.12				

325,685

Carried forward

Rs. 359,479.42

Carried forward

13
824,867.95

THE TEA RESEARCH INSTITUTE OF CEYLON.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1952.—(contd.)					
1951 Rs. B/f		Brought forward	Rs.	Cts.	1951 Rs. B/f
	GENERAL SERVICES				
19,182	Electric Power		21,914.14		
2,175	Mechanic, Electrician & Fitter		2,330.00		
880	Telephone rent & maintenance of lines		1,141.13		
828	Roads		10,442.48		
3,795	Sanitation		4,842.91		
2,303	Water supply		2,838.37		
766	Tappal lorry & book fees		938.50		
75	Drains		—		
2,536	Upkeep of grounds		3,369.16		
1,178	Guest House		2,162.42		
780	Storekeeper's salary		1,320.00		
11,191	Dearness allowance		13,525.78		
—	Estate staff 1/3rd share of salaries		3,060.00		
—	Labourers holiday pay & medical pay		6,636.80		
45,689				74,521.69	
	MISCELLANEOUS				
555	Incidental		481.00		
16,009	Provident Fund—Senior Scientific Staff		17,828.87		
12,179	Provident Fund—Junior Scientific Staff		11,463.79		
6,261	Provident Fund—Sub: Staff		6,262.09		
29,940	Passages provision		30,000.00		
4,449	Ceylon Nursing Association, Frazer Home & Medical expenses		700.00		
846	Medical fees—sub-staff		1,301.72		
2,185	Medical Scheme—Junior Staff		1,605.00		
6,857	Insurance		7,936.82		
3,052	Watchmen & caretakers		5,813.04		
600	Observatory allowance		625.00		
492,855					
82,933					
		Carried forward	84,017.33	562,106.62	
					15
					Rs. Cts.
					824,867.95
		Brought forward			

THE TEA RESEARCH INSTITUTE OF CEYLON.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1952.—(contd.)			
1951	1951	1951	Rs. Cts.
Rs.	B/f	Rs.	Brought forward
492,855	82,933	562,106.62	824,867.95
MISCELLANEOUS (Contd.)			
2,307		5,464.59	
1,660		2,300.00	
200		749.79	
1,508		—	
88,608		1,509.28	
14,390		14,579.13	
10,294		6,717.68	
—		1,716.53	
54,259		57,985.95	
171,507		87,721.05	
LOW COUNTRY SUB-STATION			
GOVERNMENT OF CEYLON LOAN—INTEREST			
COLOMBO PLAN EXHIBITION			
DEPRECIATION			
Balance being excess of income over expenditure for the year ended 31st December, 1952.			
			Rs. 824,867.95

REPORT ON ST. COOMBS ESTATE FOR THE YEAR 1952.

Staff. Mr. F. C. Daniel—Superintendent.
Mr. B. Asirvadem—Field Assistant.

Acreage.

	A.	R.	P.
Tea in bearing	281	2	00
New Clearing	9	2	28
Green Manure clearing	12	0	00
Land fit to open in tea	5	3	00
Buildings and Gardens	46	0	11
Waste Land and Ravines	32	0	24
Fuel Clearings	36	3	14
	<u>423</u>	<u>3</u>	<u>37</u>

Weather. (Estate Gauge).

	Rainfall	Wet Days	Sunshine
Registered in 1952	113.53"	238	1817 hrs.
Registered in 1951	108.17"	246	1939 hrs.
Decennial average (1943 - 1952)	94.12"	233	1928 hrs.

Rainfall for the year was a little higher than 1951 and the highest recorded since 1943. In May a rainfall of 22.55" was recorded, which show a considerable increase over all records for this month since 1943.

Crop.

	1952	1951
Estimate	220,000 lbs.	220,000 lbs.
Total Crop (Including Broken Mixed)	267,974 lbs.	265,146 lbs.
Yield per acre on 286½ acres		925 lbs.
Yield per acre on 281½ acres	952 lbs.	

The increase in the previous year's crop may possibly be due to the combination of good growing weather and present cultivation methods. The yield per acre of 952 lbs. is an all time record for St. Coombs.

Prices and Total Crop Sold.

Year	Total crop lbs.	Gross price cts.	Net Price cts.
1952	266,446	193.74	190.92
1951	263,728	195.81	192.91

Prices were favourable during the early part of the year, but showed a falling off during the S.W. Monsoon improving towards the end of the season.

Cost of Production.

	1952 (Cost per lb.)	1951 (Cost per lb.)
Estimate	202.57	197.64
Actual	178.61	167.84

Dearness allowance included in the above was:—

	1952	1951
Senior and subordinate staff	3.73	5.90
Factory Staff	1.82	1.80
Factory Labour } Other Labour }	37.71	38.38
	<u>43.26</u>	<u>46.08</u>

Profit on Estate Working.

1952	...	Rs. 30,682/13
1951	...	Rs. 63,915/00

Profit on estate working showed a decrease despite the increase in crop. This was due to heavy expenditure on certain items in revenue account.

Capital Expenditure.

1952	Rs. 36,888/-	13.69 cents per pound
1951	Rs. 29,145/-	10.99 cents per pound

The expenditure here was:—

Factory withering
12 new line rooms
New Trailer
New Clearing
Midwife's quarters

Plucking. Normal plucking standards are maintained despite the heavy crop intake. Mechanical plucking on the $2\frac{1}{4}$ acres contour planted area was discontinued from end of April, but the effect of this type of plucking was still very noticeable at the end of the year in this area, the level table and good spread being maintained.

Pests and Diseases—Blister Blight. Control measures were commenced in January on all fields recovering from pruning. In April a small amount of hand dusting was carried out which gave adequate protection, at the time, but spraying was continued.

Manuring. Most fields had two applications of manure during the year with the exception of Nos. 9 and 10 fields which were pruned towards the end of the year.

Soil Improvement. Parts of Nos. 12 and 13 fields were thatched with Guatemala grass. No. 10 field completely thatched at 8 tons per acre giving a very heavy cover.

Green Manures. 2,128 Grevillea plants were put out in fields No. 2, 3, 4, 6, 9, 10 and 11. 550 Albizzia moluccana plants were put out in field No. 4. 863 Albizzia sumatrana were put out in fields Nos. 9 and 10; 12,771 Dadap cuttings supplied in Nos. 4, 6, 8, 9, 10, 11 and 14B.

Pruning. A fairly light type of pruning was carried out with a certain amount of cleaning out of small whippy branches. Some old seed bearers in No. 13 field were collar pruned and 'Masons' Mixture applied.

Replanting of Tea. Clonal plants were supplied to the larger vacancies in Nos. 2, 3, 4, 7, and 8 fields.

Mossing and Ferning. Contractors were encouraged to remove fern from the pruned fields and lime spraying was carried out at a rate of 4 cwt. per acre, using lime spraying nozzles and normal spray equipment.

Weeding. A large area of the estate was handed out on contract including Sinhalese contractors. The whole estate was clean weeded throughout. Eupatorium has appeared on the estate and spraying with weedicides has been carried out with some success.

Factory Machinery. The factory and machinery were maintained in satisfactory condition, but attention will be given to the very necessary re-roofing and general repainting next year.

Labour. Labour was found to be adequate to meet the present crop intake and further labour recruitment should not be necessary.

General. The tea has a healthy appearance due to the satisfactory control of blister blight and increased manure applications.

Sgd. E. S. ROSE.
Superintendent.

METEOROLOGICAL OBSERVATIONS, 1952.

ST. COOMBS.

(Laboratory Gauges)

MONTH	TEMPERATURES						RAINFALL		RAINY DAYS		SUNSHINE	
	Mean Maximum	Difference from average (20 years)	Mean Minimum	Difference from average (20 years)	Adopted Mean	Mean on Grass	Inches	Difference from average (20 years)	Days	Difference from average (20 years)	Hours	Difference from average (20 years)
January	73.9	- 0.4	58.1	+ 2.8	66.0	54.5	7.34	+ 4.20	13	+ 4	153.18	- 51.21
February	76.1	- 0.4	56.6	+ 2.2	66.4	54.0	4.54	+ 2.40	7	0	195.83	- 23.22
March	78.5	+ 0.7	55.0	- 0.3	66.8	52.6	5.39	+ 0.94	10	- 2	252.87	+ 18.26
April	77.5	- 0.1	58.7	+ 0.9	68.1	58.1	8.08	+ 1.76	22	+ 6	161.45	- 42.88
May	74.5	+ 2.8	59.9	+ 0.2	67.2	58.6	22.93	+ 11.25	22	+ 3	121.12	- 43.76
June	71.2	+ 0.4	61.3	+ 0.9	66.2	61.3	15.02	+ 3.08	29	+ 3	71.30	- 25.63
July	71.6	+ 1.5	59.6	+ 0.1	65.6	58.9	7.86	- 4.23	21	- 5	132.32	+ 24.96
August	70.5	- 0.4	60.0	+ 0.8	65.2	60.6	11.10	+ 1.21	29	+ 4	85.32	- 27.61
September	75.2	+ 3.1	57.2	- 1.1	66.2	58.3	7.11	- 1.14	18	- 3	179.67	+ 41.28
October	72.4	- 0.9	58.0	+ 0.3	65.2	58.6	14.29	+ 4.76	17	- 5	130.45	- 21.46
November	73.2	- 0.4	56.2	- 1.1	64.7	55.8	6.34	- 1.38	17	- 3	166.12	+ 6.84
December	75.0	+ 1.5	55.5	- 0.6	65.2	51.8	3.67	- 1.84	15	0	167.55	- 1.48
	74.1	+ 0.6	58.0	+ 0.4	66.1	56.9	113.67	+ 21.01	227	+ 2	1817.18	- 145.91
	Means						Totals					

REPORT OF THE DIRECTOR OF THE TEA RESEARCH INSTITUTE OF CEYLON FOR 1952.

Two Senior Staff changes occurred during the year. Mr. B. N. Webster arrived in Ceylon in January and assumed duties as Mycologist. This welcome increase in the Institute's strength was later offset by the resignation of the Agricultural Chemist, Dr. F. Haworth, who left the Island in November.

The Director made a tour of the tea producing areas of Kenya and Uganda in March and attended the official opening of the new Tea Research Institute of East Africa at Kericho.

The Deputy Director, Mr. G. B. Portsmouth, whilst on leave attended the Thirteenth International Horticultural Congress, held in London in September, and read a paper describing the work carried out by the Institute in connection with the control of the blister blight disease of tea.

The Pathologist, Mr. C. A. Loos, was granted a Colombo Plan Fellowship which enabled him to spend six months on research into nematode problems in the Helminthological Department at Rothamsted Experimental Station.

The volume of advisory work handled by the Institute still remains at a very high level and is seriously limiting the amount of time senior officers are able to devote to fundamental research. It is most desirable that the Senior Scientific Staff should be strengthened.

The reports of the Staff which follow give details of the Institute's activities during the year.

J. LAMB,
Director.

REPORT OF THE CHEMICAL DIVISION FOR THE YEAR 1952.

Staff. Dr. F. Haworth, Agricultural Chemist, left the Institute on 6th November, 1952, following his resignation in order to take up an appointment in the United Kingdom. Strenuous efforts were made to replace Dr. Haworth as quickly as possible but the demand for the services of Agricultural Chemists still exceeds the supply of trained and experienced men.

General. The long-term field experiments having over the past 25 years yielded invaluable information on the response of the tea bush to application of the major nutrients, namely nitrogen, phosphate and potash, supplementary studies of other nutrients have now been commenced. During the year work was started on an extensive series of analysis of leaf from the replicated plots of the main manurial experiment and will occupy the staff of the Agricultural Chemistry and Biochemistry departments for some time to come.

In the Technological Section the main difficulty is shortage of sufficient staff to tackle the large and potentially fruitful lines of development arising out of the basic work carried out in the past. Mr. Keegel has spent the greater part of his time on advisory work and the Biochemist, since his appointment to the Directorship, has been too closely occupied with the many difficulties which have confronted the Institute in the past few years, to be able to devote sufficient time to the logical development of the work already carried out on the biochemistry and technology of tea manufacture. The resignation of the Agricultural Chemist has increased the difficulties and priority has been given to the studies on the nutrition of the tea bush which from a long-term point of view are of more immediate importance than the technology of manufacture. Ultimately, however, the staff of the division must be strengthened.

AGRICULTURAL CHEMISTRY

Dr. Haworth reports as follows:—

1. The manurial experiment laid down in early 1951 on Guatemala grass has not yet begun to show any marked response to the heavy dressings of fertilizers being used. However, the grass is only now fully established and yielding heavily and it may be expected that some time will elapse before manurial responses become apparent. From the yield figures obtained to date it appears that an annual yield of about 60 tons of grass per acre may be expected. It was originally intended to cut the grass every 3 months, but this has proved to be too short an interval and the period has now been extended to 4 months, and it may well be that maximum yields per acre will be obtained for an even longer interval between cuttings.

The experiment on manna grass has so far been very disappointing, for in spite of 4 cwt. of inorganic manure per acre per annum, no response whatever has been obtained to date. The colour of the manured plots being very much darker green than the unmanured plots, gives some indication that responses will ultimately be obtained.

2. The investigations into the root system of the tea bush mentioned in the 1951 annual report have been extended and information obtained about the effect of digging pits and burying prunings within tea areas on the root system of the tea bush. It appears that, contrary to general belief, the burying of prunings and compost in pits between the tea rows does not lead to intense feeding root production within the buried material. On the contrary, very few feeding roots are found within the pits, even one year after the pits have been filled and covered over.

The grevillea is generally believed to be a deep-rooted species and part of the benefit of growing grevilleas in tea areas is assumed to be that the deep root penetration has a certain sub-soiling effect and also leads to nutrients being brought up from the deeper layers of the soil and deposited on the surface in the form of leaf-fall.

Several grevilleas, up to 14 years old, have been removed in different tea growing areas and so far the longest tap root which has come to light measured 4' 10". This is rather contrary to the generally held belief that the grevillea has a very deep tap root. The Tea Research Institute would be very interested to hear from any superintendent, who has extracted grevilleas with their tap roots intact, details of the depth of penetration of the tap roots of the trees which they have removed.

3. During the year a detailed examination of the root system of Guatemala grass was undertaken. On a reasonably good soil on St. Coombs Estate the grass was found to penetrate to a depth of at least 10 feet and it was estimated that, after three years' of growth, the grass had produced approximately 20 tons of dry roots per acre. This is greatly in excess of the amount of roots produced by grass in temperate countries (about 4 tons) and also in excess of the amount produced by sugar cane (about 3 tons). Where Guatemala grass is used for rehabilitating poor areas of tea this extensive root system should be of great value. However, it has been shown that any effect which Guatemala grass may have on the structure of upland soils is very short-lived. Generally speaking, however, the physical structure of the upland tea soils is good, and this failure of Guatemala grass to improve this structure is not really surprising.

4. In 1950 annual report the Plant Physiologist mentioned that nitrate of soda has now been shown to be much less effective than sulphate of ammonia as a source of nitrogen for the tea bush. Whilst this practical point has been established beyond doubt, the underlying reasons for the differential response of the tea bush to the two forms of nitrogen are not clear. Accordingly, investigations were carried out during the year in an attempt to find out why nitrate of soda is such a poor manure for the tea bush. From detailed experiments it appears that there is an ample supply of nitrate present in the soil on St. Coombs Estate, and that this amount is not increased by manuring with sulphate of ammonia. It has also been shown that, although nitrate of soda does lead to a slight rise in the pH status of the soil, the extent of the rise is insufficient to account for the lack of response to this particular fertiliser. It would appear, therefore, that the tea bush does not necessarily utilise nitrogen in the form of nitrate, and evidence has been accumulated which indicates that the tea bush either takes up its nitrogen in the form of ammonia or that the nitrogen nutrition is mycorrhizal in nature. This latter possibility is being investigated by Mr. Webster of the Mycological Department.

Consequent upon this work, an experiment has been laid down on St. Coombs Estate to find out whether nitrogen in the form of *bulky* organic materials will be more efficiently utilised by the tea bush than nitrogen supplies in the form of sulphate of ammonia. It is hoped that this experiment may be repeated on other estates in other tea growing areas.

5. Detailed leaf ash analysis, using material from the long established N.P.K. experiment on St. Coombs Estate, has been carried out and many of the results are extremely interesting. The calcium content of old tea leaves has proved to be much higher than was anticipated and the interaction of the various manurial constituents, in affecting the composition of the leaves, is being worked out. Full details of this work will be published in due course.

The nitrogen content of flush from various clones was investigated. Flush was taken in early July from each of some 62 clones under trial at St. Coombs. Although the nitrogen contents (Tables I & II) vary very widely from clone to

clone no pattern is evident and there is no correlation between yield and quality on the one hand and nitrogen content on the other.

It must be remembered, however, that the quality ratings used are based on small scale tests, and may change when larger supplies of leaf make normal manufacture possible.

The 1947 series clones (25 in all), for which the data is presented in Table II, were found to have a significantly higher amount of nitrogen in the flush than those from the old clonal area (37 in all), for which the data is presented in Table I. Not only are the 1947 series clones much younger in age than the latter series but they are also one year younger from pruning. This observed difference in nitrogen content is, therefore, presumably an effect of the age difference between the two series, but as to whether it is an effect of age from pruning or age from planting, cannot be determined from the data.

General. The amount of advisory correspondence continues to increase. In addition, approximately, 1,500 samples of soil were examined during the year mostly with regard to their suitability for use in V.P. nurseries.

Table I. *OLD CLONAL AREA*—calculated yields per acre per annum, based on pluckings from May 1949, to May 1952, results of quality tests and percentage nitrogen in flush.

Clone No.	Yield (lbs.)	QUALITY TESTS				% nitrogen
		No. of Tests	Above Average	Average	Below Average	
1	1155	4	1	2	1	3.8
4	1188	5	3	1	1	4.1
105	472	7	3	1	3	4.6
14	653	4	4	—	—	3.7
396	725	7	—	3	4	4.5
19	567	3	1	1	1	4.2
21	1468	9	6	3	—	3.8
222	1215	3	2	1	—	3.8
34	992	11	1	7	3	4.7
37	1398	11	4	3	4	3.5
1114	1545	11	1	2	8	4.4
142	538	7	—	4	3	3.9
343	1095	11	2	6	3	4.0
46	882	11	2	4	5	4.0
1530	1270	11	7	4	—	4.5
928	1415	11	7	4	—	3.9
1294	846	66	61	5	—	3.8
407	908	11	1	2	8	4.3
128	918	12	5	6	1	3.9
839	662	11	2	5	4	4.5
777	1303	11	3	6	2	4.0
603	1052	9	—	4	5	4.1
216	885	11	9	1	1	3.9
331	955	10	4	6	—	4.1
483	825	12	3	9	—	4.1
170	1145	5	2	2	1	3.7
235	820	5	4	1	—	4.0
1001	837	5	3	1	1	3.5
425	1012	5	3	2	—	4.2
708	815	5	—	1	4	3.9
896	897	5	—	2	3	3.4
1054	765	6	1	3	2	3.8
1128	892	6	2	4	—	4.0
1446	1267	5	1	2	2	3.9
1118	600	6	1	2	3	3.6
946	792	6	—	1	5	3.5
1456	765	6	2	4	—	3.5
					Mean	3.98
					±	.05

Table 2. 1947 CLONAL AREA—Calculated yields per acre per annum, based on pluckings from June 1950, to June 1952, results of quality tests and percentage nitrogen in flush.

Clone No.	Yield (lbs.)	QUALITY TESTS				% nitrogen
		No. of tests	Above average	Average	Below average	
2023	886	3	2	1	—	4.5
2025	1160	3	1	2	—	4.6
2039	644					4.6
2016	561					3.9
2020	728					4.1
25	954					3.6
2019	631					4.0
2011	693					4.1
2015	570					4.0
2021	1035	4	4	—	—	4.7
2014	695					4.2
2044	742					4.1
2022	1074	4	2	2	—	4.4
2043	990	3	—	—	3	4.3
2042	758					4.6
2041	998	4	4	—	—	3.8
2049	500					4.1
2006	323					4.2
23	793					3.8
2017	660					4.2
2024	1768	6	5	1	—	4.5
2050	1240					4.4
2046	1040					4.4
N3	758					4.1
2026	750					4.8
Mean ±						4.24 .06

BIOCHEMISTRY

Mr. M. S. Ramaswamy reports as follows:—

Research work in the section was seriously curtailed during the year under report on account of the routine analyses that had to be carried out for the Agricultural Department in connection with the micro determinations of manganese in tea samples, and also in connection with a set of withering experiments that were carried out for the technology section.

1. Carotene in Tea. The study of the fate of carotene during the manufacture of tea was undertaken. Green leaf contains about 2-3 hundred parts per million carotene on the dry weight basis, while this is reduced to about 50 - 60 parts per million in made tea. However, carotene being insoluble in water it does not enter the tea cup. The work has no practical value, and therefore further work on this line was suspended.

2. Enzymes. (a) Pectase and Polyphenol Oxidase in Tea. The role of pectase during fermentation and especially its role in controlling oxidation of catechins by polyphenol oxidase was further investigated. The results already reported were confirmed when clone No. 9 treated with copper (10 p.p.m.) was used for the experiments. Further evidence of the inhibition of polyphenol oxidase activity by pectase was adduced by adding to the leaf citrus pectin (B.D.H., 100 grade), which enhances the pectase activity. The

taster's report* on these teas was also obtained, and it clearly demonstrated that pectic acid formed during fermentation prevents the easy access of air to the catechins for their normal oxidation. Proof of this inhibition was also obtained by the analysis of the made teas for their total water soluble and ethylacetate soluble fractions. Full details will be published elsewhere.

(b) Fate of bound and free methyl alcohol in tea. A preliminary study of the fate of methyl alcohol (bound and free) present in tea leaf at various stages of its manufacture was undertaken to find out whether it forms any ester during fermentation. Although no direct evidence has been obtained for the presence of an esterase, it was found that at least part of the methyl alcohol produced during fermentation forms an ester. The nature of the ester formed and also the nature of the esterase (if any) responsible for this synthesis are under further investigation.

3. Fate of Copper Residue Sprayed on Tea Bushes. In our earlier work it was found that part of the sprayed copper was tenaciously bound to the leaf in spite of a heavy rainfall. With a view to ascertaining the nature of this behaviour the following experiment was conducted to determine the fraction of the tea leaf which has such a binding capacity for copper.

Sixteen branches of a tea bush from a single clone were divided into two parts of 8 branches each and placed in a beaker of water. One batch was dipped in "Perenox" suspension (2 ounces in 4 gallons of water) while the other was untreated (control). The branches were left in water for 24 hours to allow for any absorption of the copper residue by the leaves to take place. The leaves from the treated batch were then removed from the branches and thoroughly washed under a tap. Every leaf was mopped with cotton wool while being washed under the tap. The midrib, the tip and the base of the leaf were cut off as copper residue was found to be mechanically held to these parts in spite of washing. The leaves were finally washed in distilled water (twice) and then dried in the oven.

The leaves from the control batch were similarly treated (*i.e.* the tip, midrib and base were cut off) and washed first under a tap and then twice in distilled water. They were then dried in the oven.

Ether soluble fraction. Two grams of the dried and powdered (20 mesh) samples were extracted with ether in a Soxhlet's continuous extraction apparatus for 40 hours (until no further green colouring matter was found to be extracted). The ether was distilled off and the residue taken up for determination of copper content.

Pectins. 10 grams of the sample was extracted with 0.5% Ammonium oxalate (3 × 300 ml for 6 hours on a water bath), filtered, and evaporated to 200 ml on a water bath. Pectins were precipitated by the addition of absolute alcohol to give a final concentration of 75% to alcohol. The precipitate was washed with 80% alcohol and dried in the oven. The dry pectins were powdered and used for the determination of the copper content. The results are given in Table I.

Table I. *Copper content of various fractions of sprayed and unsprayed tea (in parts per million of dry matter).*

Sample	Control (Untreated)	Treated
1. Original sample	27.8	87.0
2. Ether soluble fraction	4.5	8.7
3. Ammonium oxalate extract	53.0	139.0
4. Pectins	17.8	18.4

*We are indebted to Messrs. Forbes & Walker Ltd., Colombo, for their report on these teas.

The copper is, therefore, probably bound by the ether soluble constituents of the tea leaf (the surface waxes or the chlorophyll, or both).

Pectins do not seem to bind the copper residues; the treatment given for the extraction of the pectins may, on the other hand, be too drastic and cause any bound copper to go into solution in alcohol.

Miscellaneous. (a) About 400 samples of pruned material from the Agricultural Chemistry section were analysed for their manganese content.

(b) With a view to ascertaining whether the manganese content of tea has any correlation with its quality, a preliminary study of the manganese content of a number of clonal material chosen for their quality was made. Though no correlation seems to exist between the manganese content of the teas and their quality, one particular clone (No. 1294), which has been reported to be the best of all the clonal material at St. Coombs, was found to contain the minimum manganese content.

(c) Withering experiments. Withering of tea in a chamber (especially constructed in the workshop) under various conditions of air-flow and temperature gave the following results.

Exptal. Conditions	Degree of Wither
1. Variation in the speed of air flow	Variable and erratic.
2. Variations in the temperature and speed of the incoming air	Increased rate of wither at higher temperature.
3. Variations in the speed of air flow under constant humidity conditions.	Variable and erratic.

TECHNOLOGY

Mr. E. L. Keegel reports as follows:—

Mechanical Withering. In brief, this process is different from tat withering and quick withering in that the leaf is spread thickly in a confined space through which a current of air is passed. It is not a process which accelerates withering since normal temperatures are employed. It was investigated with the object of finding out whether by condensing withering space a solution could be found to the problem facing many estates today—namely, lack of withering space as a result of increased crops.

A great deal of work had first to be done starting from a small laboratory unit before a suitable experimental plant could be constructed. Considerable technical difficulties had to be overcome and it was not till about the end of the year that the experiments gave satisfactory results.

It would appear from the results of the work done so far that mechanical withering on a commercial basis is possible if not for the fact that for a spread of over 4" turning over of the leaf is necessary for uniformity in the wither. Of course, to consider a spread thinner than 4" is worthless because a bank of 20 tats would function more economically than a plant occupying the same floor area.

It is obvious, therefore, that if mechanical withering is to prove a commercial success some means must be found to wither evenly a layer of leaf much thicker than 4" without having to turn it. It is probable that this could be done

by reversing the air flow at regular intervals and this question is now under consideration.

As regards the teas from this process Tea Tasters found them very little different from teas that had been made from leaf normally withered.

2. Factors Supposed to Affect Quality of Made Tea. Varied opinions still exist on such matters as degree of wither, fermentation, etc. Accordingly, a systematic investigation was started to check the validity of some of the views held on certain aspects of manufacture. It is hoped that the results of these experiments will clear some of the doubts about the effect of the more common factors on quality.

(a) **Degree of Wither.** Comparison of light and hard withers, where the average difference in the outturn of made tea to withered leaf was 7%, showed that there was very little difference between the two. Outturns as low as 38% and as high as 52% were tested and in no instance could it be said that the teas were flaky. The reason for this was that the greatest care was taken not to under-wither or over-wither the leaf.

The results indicate that a wide range is permissible in withering, but the most important consideration is evenness in wither.

(b) **Humidity during Fermentation.** The drying effect of the surface of fermenting dhool and its resultant blackening has given cause for unnecessary misgivings. Although it must be admitted that high humidity is beneficial for fermentation too much importance need not be attached to its influence. A series of experiments was carried out where the same leaf was fermented under two conditions, one with a hygrometric difference of 2° and the other with 4°. The mean dry bulb temperatures were 68° F. and 74° F. respectively.

The bigger hygrometric difference in conjunction with the higher temperature did result in a marked blackening of the surface, but on the whole this had no effect whatsoever on either the rate of fermentation or infusion. The leaf below the top surface was, in fact, invariably found to be more fully fermented than its counterpart under humid conditions. The probable explanation is the higher temperature.

No difference of commercial importance was found in the characteristics of the teas over the normal range of fermenting periods. For prolonged periods, however, the indications were that fermentation was slightly retarded by the lower humidity. The conclusion that can be drawn is that a slight drying up of the surface of fermenting leaf is perfectly innocuous.

(c) **Period of Fermentation.** Investigations over a wide range clearly showed that variations of 15 to 30 minutes made very little difference once the leaf had lost its raw character. A serious decline in quality occurred when fermentation was unduly prolonged. As colour of a liquor is also an important characteristic, both colour and quality have to be considered together for determining the optimum period of fermentation.

It was evident from the results that as in the case of degree of wither periods of fermentation can vary within a fairly wide limit without any harmful effects. The indications are that if fermentation periods lie within a range of 2½ to 4½ hours under-fermentation or over-fermentation is unlikely to occur.

(d) **Density of Spread Fermentation.** This must not be confused with thickness of spread. The investigation carried out was to determine the effect of spreading the leaf compactly without altering the thickness. In the experiments that were conducted a thickness of $1\frac{3}{4}$ " was maintained and a rate of spread of 5 lbs. per square foot compared with $2\frac{1}{2}$ lbs. per square foot. Though the latter teas were very slightly preferred there was very little to choose.

The results of all these experiments and other investigations show that there is plenty of latitude in the withering, rolling and fermenting processes. Nevertheless, it does not follow that a complacent attitude to manufacture can be adopted. Though the effect of any one factor may be negligible, the cumulative effect of a number of such factors can be considerable enough to change the whole character of a tea. There are also the factors outside the realms of manufacture which have to be considered, namely, jat, standard of plucking, age of leaf, season and situation of the estate and factory. It is, therefore, apparent that if the best is to be made of the leaf every factor must be considered in relation to its effect on each other. This naturally calls for the closest attention to detail in manufacture on every individual estate. Otherwise, it will be quite impossible to develop a manufacturing technique best suited for the conditions on any particular estate.

3. Unorthodox Manufacture. For many years past the Institute has borne in mind the possibilities of simplified processes of manufacture. Long-term experiments of this nature are advisable in order to anticipate possible future necessities. It is also an interesting fact, possibly a significant fact, that visiting industrial experts and missions invariably suggest the desirability of such experiments. The tea industry has even been accused of lethargy as regards the processing of tea. What perhaps critics outside the industry fail to understand is that the product from unorthodox manufacture has never found favour with the trade. It is only reasonable that this should be so. The present system of manufacture, involving, it is true lengthy processes has been developed over many decades with due regard to the trade requirements. Any departure from the high standards set is, therefore, met with suspicion.

In the course of the year P.F. manufacture, which had been previously carried out on an experimental basis, was tried out on a full commercial scale. Results were difficult to assess.

The use of the Clivemeare roller for withered leaf, which proved a success in pre-war years when experimental invoices were sold in London, was extended to the manufacture of 50,000 lbs. of B.O.P. and B.O.P.F. for a large blending firm in London. The liquoring quality of these teas was the most important factor as far as they were concerned. From the Colombo market point of view, however, the very poor appearance of the Clivemeare teas outweighed any improvement in the liquor and discounted the value on the market very considerably.

Numerous experiments were also carried out with the Legg Cutter with a view to shortening the normal rolling process. Cutting of withered leaf before rolling, cutting of the rolled leaf, fine cuts, coarse cuts, re-rolling were all tried out. Many modifications were made but the teas were in all respects inferior to teas made by traditional methods. The true 'Ceylon' character was lacking in these samples.

4. Effect of Length of Plucking Round. The long term experiment, referred to in the annual report for 1951, was commenced in August. Fortnightly manufactures, comparing a 7 day round with a 14 day one, are being

carried out. Records of yield and plucking costs are also being collected. It is too early yet to assess the relative merits of the two rounds, but it is beyond all question that the teas from the shorter round are superior in every respect.

5. Crop Protection Experiments. The manufacture of leaf from experiments on spraying carried out by the Pathology Department was continued.

6. Clonal Manufacture. 28 manufactures of clones were done for 6 estates on 6 separate occasions.

Acknowledgments. As usual we have received considerable assistance from the Tea Tasters in Colombo, and to all those gentlemen who have spared so much of their time to taste our experimental teas we express our grateful thanks.

The Technologist also wishes to record his personal thanks to the firms, individuals and members of the Institute staff who helped in the contribution the Institute made to the Agricultural and Industries Pavilion at the Colombo Exhibition.

J. LAMB,
Biochemist.

REPORT OF THE PLANT PHYSIOLOGIST FOR THE YEAR 1952.

Staff. During the Director's absence on leave the Plant Physiologist also carried out duties as Acting Director from 5th March to 20th May, when he himself proceeded on long leave.

The Agricultural Chemist Dr. F. Haworth, acted for the Plant Physiologist until 2nd November, after which the responsibility for the department was taken over by the Director.

Mr. E. S. Rajiah, who had been stationed on Ury Group, Passara, in charge of the Mahapahagalla dusting experiment, resumed his duties in the department on 31st March.

Mr. G. A. Mendis resigned his post as laboratory attendant on being appointed as Instructor in the Small Holdings Advisory Service. Mr. H. Solomon was appointed to fill the vacancy.

Correspondence. 267 letters were received and 273 despatched.

General. 28 estate visits were made during the year and three Planters' Associations' meetings attended.

A short refresher course in Crop Protection was held at Radella Club on the 18th April at which the Plant Physiologist gave some of the lectures and the staff of the department acted as demonstrators.

Assistance was also given to the Superintendent of St. Coombs in connection with the supply and propagation of the clonal material required for planting up the new clearing area in No. 10 field.

While on leave the Plant Physiologist attended the 13th International Horticultural Congress, held in London in September, and read a paper describing the work carried out by the Institute in connection with the control of the blister blight disease of tea.

Soil Samples. Over 350 samples of soil were received, mainly from new clearings and nursery sites, for pH determination and eelworm examination.

Tea Selection and Vegetative Propagation. During the year 3 new clones were planted in the main clonal plots, and 56 new mother bushes were selected and propagated. Of these 23 were selected from an estate in the district with a view to possible resistance to meadow eelworm (*Pratylenchus pratensis*). These bushes appeared vigorous at the time of selection, although the soil near the roots showed a high population of meadow eelworm on examination.

The growth of the existing 42 clones which were planted in the meadow eelworm infested old nursery is most disappointing. None of these clones would appear to have a satisfactory degree of resistance to eelworm attack.

The selection of bushes that appear to show resistance to blister blight is now becoming rather difficult as a result of widespread adoption and success

of the recommended crop protection measures. However, selection work is being continued in the hope that new finds may lead to further improvement in yielding capacity and disease resistance.

1947 Clonal Area. The majority of the 28 clones planted in this block are satisfactory as regards yield and growth. They completed the second year of plucking at the end of May and gave an average yield for the whole year of 1,128 lbs. per acre. Although these clones were selected prior to the advent of blister blight many of the highest yielders appear to be relatively resistant to the disease. Yields for the second year of plucking of the better clones are shown in Table 1.

Table 1. *Yields from 12-6-51 to 27-5-52.*

Clone	Calculated yield lbs. per acre
2024	2,295
2025	1,830
2023	1,685
2022	1,560
2021	1,500
2016	1,485

Blister Resistant Area. The 48 clones selected mainly for blister blight resistance were brought into plucking during the year. As anticipated the yields of most of these clones are disappointing although many appear to exhibit a high degree of resistance to blister blight attack. Results for the first 9 months of plucking give the yield distribution shown in Table 2.

Table 2. *Yield distribution of blister resistant clones.*

Yield Range lbs. per acre	No. of Clones
100 - 199	4
200 - 299	6
300 - 399	12
400 - 499	12
500 - 599	3
600 - 699	4
700 - 799	4
800 - 899	1
900 - 999	1
1000 - 1099	—
1100 - 1199	—
1200 - 1299	—
1300 - 1399	1

Clonal Root Systems. A total of 13 clones which had been planted in a block in 1944, were discarded in order to provide space for a new nursery and new green manure trial beds.

Some of these clones were very susceptible to blister blight and the remainder low yielders. Advantage was taken of this opportunity to make observations on the type of root system produced by vegetatively propagated plants after 8 years of growth. Details of these observations are recorded in Table 3.

Table 3. *Root systems of 8 year old clonal plants.*

Clone	No. of bushes examined	Mean no. of roots above $\frac{1}{2}$ " diameter	Mean depth of main roots Inches	Mean spread Inches	Remarks
1544	10	8.6	23.7	40.0	Mainly horizontal. Strong spreading laterals. Fair number of feeding roots.
769	10	8.4	25.6	48.0	Mainly horizontal. Many feeding roots.
789	10	8.8	21.2	45.0	Mainly horizontal. Few feeding roots.
223	10	15.4	34.1	52.8	Intermediate. Strong spreading laterals. Fair amount of feeding roots.
S255	10	12.7	26.4	46.4	Intermediate. Few roots with a tendency to grow horizontally.
2050	6	10.3	27.2	39.5	Intermediate.
1002	10	14.2	32.9	56.1	Intermediate. Well balanced thick laterals. Fair number of feeding roots.
N3	10	28.0	41.1	59.3	Intermediate and vertical. Strong spreading roots. Numerous feeding roots.
N1	10	9.4	31.8	45.6	Intermediate. Mature roots well balanced. Many feeding roots.
2049	10	12.6	30.8	47.1	Intermediate. Thick laterals.
S261	7	11.1	41.3	55.3	Intermediate. Deeply anchored.
S265	10	15.6	28.7	66.6	Mainly horizontal. Moderate amount of feeding roots.
S220	7	16.4	33.9	56.8	Intermediate. Thick laterals.

"Exflor" as a Rooting Medium. "Exflor" is an expanded mica, which, because of its lightness and high water holding capacity, is used as a medium for propagating many species of plants. As a rooting medium for tea cuttings, however, "Exflor" proved most unsatisfactory, either alone or when mixed in various proportions with sand.

Comparison of Single and Double Node Cuttings. The rooting behaviour of "short" double node cuttings was compared with that of the standard single node cuttings. The "short" double node cutting is very similar to the single node cutting but, instead of the second cut being made just above the lower bud, it is made just below the lower node, and the leaf removed. Thus the cutting consists of an upper node with bud and leaf, one internode and a lower node with leaf removed. That the additional food reserves stored in the lower node did not give any increased rooting can be seen from the results given in Table 4.

Table 4. *Percentage of cuttings rooted after 6 months.*

Clone	Type of cutting	
	Single node	Double node
23	80%	72%
25	40%	24%
222	60%	24%
1526	52%	30%
Mean	58.0%	37.5%

Effect of the Initial State of Bud Development on the Rooting and Growth of Cuttings. An experiment was carried out in which the effect of the following four different initial states of the bud on rooting and subsequent shoot development were compared:—

- A Single node cutting with dormant bud.
- B Single node cutting with bud starting to grow.
- C Single node cutting with shoot developed to bud and three leaves.
- D Same as C, but with shoot broken back.

Some 40 cuttings of each type, from a total of 8 different clones, were put out, and the amount of rooting and leaf development produced after 6 months are given in Tables 5 and 6.

Table 5. *Number of cuttings rooted after 6 months.*

Clone	Initial state of cutting			
	A	B	C	D
2110	22	21	17	13
2111	11	13	11	7
2113	14	12	10	9
2114	19	25	16	20
2117	26	34	21	33
2118	35	37	12	33
2119	15	20	15	13
2120	30	29	22	26
Total	172	191	124	154
Mean	21.5	23.9	15.5	19.2
Percentage	53.8	59.7	38.8	48.1

Table 6. *Number of cuttings with shoots bearing fully expanded leaves after 6 months.*

Clone	Initial state of cutting			
	A	B	C	D
2110	1	10	14	5
2111	0	10	10	3
2113	0	10	4	1
2114	3	18	11	10
2117	4	28	15	20
2118	3	15	6	6
2119	2	13	9	5
2120	16	27	20	22
Total	29	131	89	72
Mean	3.6	16.4	11.1	9.0

It is evident that cuttings taken in the initial state B, *i.e.* with bud starting to grow, have both rooted and subsequently grown better than any of the others. State A, *i.e.* with dormant bud, gives good rooting, but the subsequent development is delayed. Planting cuttings from state C, *i.e.* with shoot developed to bud and 3 leaves, would appear to have an adverse effect on rooting success and such shoots should accordingly be broken back to state D.

Propagation of Dadap. Following reports of difficulties encountered in establishing dadaps (*Erythrina lithosperma*) it was decided to try out the effect of the hormone preparation Hortomone A. 5 foot cuttings were taken and allowed to stand with their basal ends immersed to a depth of 2 inches in a solution of 3 ccs. Hortomone A in half a pint of water for 18 hours. They were washed in water and then planted out into trial beds with an equal number of untreated cuttings. For the purposes of the experiment the cuttings used were graded according to the diameter at the base as under:—

A. Between 3 and 4 cms.

B. Between 2 and 3 cms.

C. Between 1.5 and 2 cms.

At the first examination, 2 weeks after planting, all the cuttings had callused. At the second examination, 4 weeks after planting, all had produced roots. There was apparently no effect of the Hortomone A treatment as shown by the dry weights of roots produced after 9 weeks. (Table 7.)

Table 7. *Dry weights of roots produced 9 weeks after planting.*

Plot No.	Hortomone A treated	Untreated
	oz.	oz.
1	0.50	0.50
2	0.75	0.75
3	1.00	1.00
4	1.00	0.75
5	1.25	1.25
6	1.50	2.00
Total	6.00	6.25
Mean	1.00	1.04

Root production was, however, significantly better in the case of the largest diameter cuttings as can be seen from Table 8.

Table 8. *Effect of size of cutting on dry weight of roots.*

Plot No.	A 3 - 4 cms.	B 2 - 3 cms.	C 1.5 - 2 cms.
	oz.	oz.	oz.
1	1.25	1.00	0.50
2	1.25	1.00	0.50
3	1.50	1.00	0.75
4	2.00	0.75	0.75
Total	6.00	3.75	2.50
Mean	1.50	0.94	0.63

The amount of new shoot growth produced by the different diameter cuttings was also significantly different in each case. (Table 9).

Table 9. *Dry weights of new shoot growth produced 9 weeks after planting.*

Plot No.	A 3 - 4 cms.	B 2 - 3 cms.	C 1.5 - 2 cms.
	oz.	oz.	oz.
1	9.50	7.25	3.25
2	8.00	6.00	3.00
3	14.00	8.75	4.50
4	11.00	6.00	4.75
Total	42.50	28.00	15.50
Mean	10.63	7.00	3.88

Green Manures. A number of new species of green manure plants were under trial during the year. For considerations of space detailed observations on their behaviour will be held over until the next report.

Weedicides. A series of trials, too extensive to be reported in detail, were carried out during the year with the various weedicides mentioned in the last two reports. (Bulletins 32 and 33). The weedicides were tested both singly and in combination at several different concentrations and application frequencies. The application rate was 200 gallons per acre when a knapsack sprayer was used and 800 gallons per acre when the weedicides were watered on from a watering can. The range of concentration employed is given in Table 10.

Table 10. *Weedicide treatments.*

Name	Active ingredient	Amount of active ingredient
Fernoxone (2,4-D)	2, 4-dichloro-phenoxy-acetic acid	2½ lbs. per acre
IPC 5% dust	Isopropyl N-phenyl-carbamate	100 lbs, 200 lbs, 400 lbs. per acre
IPC 50% wettable powder	Isopropyl N-phenyl-carbamate	10 lbs, 20 lbs, 40 lbs. per acre
IPC dispersible liquid	Isopropyl N-phenyl-carbamate	0.5%, 1.0%, 2.0% solution
Kanex	Pentachlorophenol	2 gals, plus 3 gals diesel oil per acre
Phenoxylenec (MCPA)	2-Methyl 4-chloro-phenoxy-acetic acid	2/3rd, gallon per acre
Atlacide	Sodium chlorate	40 lbs, 100 lbs, 200 lbs. per acre
Tecane (TCA)	Sodium trichloracetate	20 lbs, 50 lbs, 150 lbs, per acre

(1) **Illuk.** (*Imperata cylindrica*). One half of each plot was cut back to ground level before the first application. This did not, however, appear to increase the effectiveness of any of the treatments. Of all the weedicides tested only TCA gave a complete kill and three applications of 50 lbs. per acre

appeared to be the lowest amount required to be fully effective. Apart from sodium chlorate, which gave a 60% kill at the highest rates used, none of the other weedicides tested showed any indications of killing.

(2) **Couch** (*Panicum repens*). In these trials one half of each plot was forked over before the first application. This did not appear to increase the effectiveness of any of the treatments. Here again TCA was the only effective killer either alone (3 applications of 50 lbs.) or in combination with sodium chlorate (100 lbs. TCA plus 100 lbs. sodium chlorate) or Kanex (100 lbs. TCA plus 2 gallons Kanex).

(3) **Effects on Tea.** All weedicides so far tested cause damage to tea and must not, therefore, be used indiscriminately or without proper scientific advice. A summary of the more obvious effects up to 4 months after treatment is given in Table 11.

Table 11. *Effect of weedicides on tea.*

Weedicide & concentration (lbs. or gallons per acre)	Sprayed on		Sprayed on soil around	
	Pruned bush	Bush in plucking	Pruned bush	Bush in plucking
TCA 20 lbs.	Little growth.	Slight defoliation.	No effect.	No effect.
TCA 50 lbs.	No growth.	Leaves scorched; growth checked.	Growth checked.	Leaves scorched.
TCA 150 lbs.	No growth.	Complete defoliation. No growth.	Buds break, but shoots die.	Leaves scorched, growth checked.
Sodium chlorate 40 lbs.	No growth some branches.	Scorch & defoliation.	No effect.	No effect.
„ 100 lbs.	Growth delayed.	Scorch & defoliation. Some dead shoots.	No effect.	No effect.
„ 200 lbs.	Growth delayed.	Scorch & defoliation; little recovery.	Growth checked.	Growth checked.
IPC 100, 200 & 400 lbs.	No effect.	No effect.	No effect.	No effect.
MCPA 2/3rd gallon	Slight distortion.	Distortion of flush & leaves.	No effect.	No effect.
2,4-D 2½ lbs.	Reduced recovery.	Distortion of flush & leaves.	No effect.	No effect.
Kanex 2 gls.	No effect.	Some scorch & distortion.	—	—

TCA is obviously far and away the most dangerous of these weedicides since a concentration of only 50 lbs. per acre causes serious damage however applied. In this connection the results of a small experiment carried out in 1951 are worth reporting. With the object of controlling moss and lichen bushes were sprayed after pruning with (a) 5% Ovicide (b) 2.5% Sodium trichloro-acetate and (c) Limewash, all at a rate of 60 gallons per acre. 4 months after application 14% of the TCA treated bushes had failed to recover. The weights of tipplings from the treated bushes were:—

	lbs./acre
Ovicide ...	256.6
TCA ...	123.2
Limewash ...	231.5

Thus the tipping weights of the TCA treated bushes were only half those of the other treatments. Bud counts made 1 month after application, however,

showed little difference between treatments, which indicates a delayed effect of the TCA. This delayed effect of TCA is confirmed by the fact that 14 months after pruning 8.3% of the TCA treated bushes were still only partially recovered while 1.7% were dead.

It should be noted that, although Table 11 shows IPC to have produced no damage in the field, treatment of young plants in pots with this chemical resulted in death. Field results are of course subject to considerable variation since all weedicides are relatively ineffective if there is heavy rain immediately after application.

The weed *Commelina* sp. appears to be entirely unaffected by any weedicide treatment.

Field Experiments. Two of our long term field experiments completed cycles during the year. Some of the results obtained are briefly indicated below.

(1) **The Fish Leaf Plucking Experiment.** The treatments reversed in the previous (3rd) cycle were again reversed in the current (4th) cycle. The more important effects of fish leaf plucking on yield are shown in Table 12.

Table 12. *Effect of fish leaf plucking on yield.*

2nd cycle	Treatment		Total yield	
	3rd cycle	This cycle	Lbs./acre	Difference
Fish	Single	Fish	2326	119
Single	Single	Single	2207	214
Fish	Fish	Fish	1993	62
Single	Fish	Single	1931	

From a study of this table it will be seen that a reversion to fish leaf plucking following normal plucking in the previous cycle has only given a short term increase in yield of 119 lbs. per acre, as contrasted with the much larger increase of some 476 lbs. per acre given in the previous cycle (Bulletin No. 31 p. 36).

The general level of yields in the current cycle is somewhat lower than previously, as can be seen from the fact that the continuous normal plucking treatment has only yielded some 214 lbs. per acre more than the continuous fish leaf plucking treatment, as contrasted with some 429 lbs. per acre more in the previous cycle. It would appear that the very low potash application rate of 20 lbs. per acre per annum is now starting to be felt and that yields are limited by potash. This is also borne out by the very anomalous responses which are being given to the 80 lbs. per acre double nitrogen applications. Accordingly in the fifth cycle the potash applications will be increased to a level of 40 lbs. per acre.

The most serious effect of continuous fish leaf plucking is to be seen in the enormous reduction in maintenance leaf and pruning wood carried by the bushes at the end of the cycle. Data from samples taken when the bushes were pruned down at the end of the fourth cycle are given in Table 13.

Table 13. *Dry matter distribution for continuous plucking treatments.*

	Treatment		Fish/Single
	Single	Fish	
	lbs./acre	lbs./acre	
Flush plucked	2,207	1,993	90%
Maintenance leaf	3,286	972	29%
Wood	5,830	1,617	28%
Total growth	11,323	4,582	40%

(2) **The Phosphate Quality Experiment.** This experiment, which was designed to compare the effects of superphosphate and mineral (Saphos) phosphate at the 0, 15 and 30 lbs. per acre levels, completed its first 4 years cycle during the year. Results appear to have been limited by the low levels of 40 lbs. nitrogen, as sulphate of ammonia, and 20 lbs. potash, as the muriate, application rates which were originally laid down. These were accordingly doubled from the third year onwards. For record purposes the first cycle yields are given in Table 14.

Table 14. *Dry matter yields in lbs. per acre for first cycle.*

Kind of phosphate	Phosphate Level			Mean
	P ₀	P ₁₅	P ₃₀	
Super	2101	2426	2565	2364
Mineral	2274	2326	2408	2336
Mean	2187	2376	2486	2350

(3) **Guatemala Grass Experiment.** A new and fully replicated experiment with Guatemala grass, comprising 48 sub-plots, was laid down, in conjunction with the Agricultural Chemist, during the year. The treatments to be compared include six levels of nitrogen manuring and two each of phosphoric acid and potash.

G. B. PORTSMOUTH,
Plant Physiologist.

REPORT OF THE PATHOLOGICAL DIVISION FOR THE YEAR 1952.

GENERAL PATHOLOGY

Mr. C. A. Loos reports as follows:—

Staff. Mr. C. A. Loos, Pathologist, was awarded a Commonwealth Technical Co-operation Scheme Fellowship for advanced studies in nematology tenable at the Nematological Department of the Rothamsted Experimental Station, Harpenden, Herts, England. He proceeded on study leave on April 25th and returned to Ceylon on November 30th. During his absence the Mycologist, in addition to his own duties, was in charge of the Pathological Division.

Advisory. 1,020 letters were received and 851 despatched during the year.

399 consignments of specimens were received for disease identification and report.

Blister Blight. For the first time in Ceylon's history almost the total acreage of tea in upcountry areas, subject to both monsoons, was under fungicidal protection. This resulted in the limiting of the disease to such an extent that, on the few scattered unprotected areas on St. Coombs, the loss of crop due to blister blight was considerably lower in comparison with the previous year.

Crop Protection Experiments. St. Coombs No. 9 field crop protection experiment was pruned in June. The following are the results for the 3½ year cycle.

Table 1. *St. Coombs No. 9 Field Crop Protection Experiment—Crop returns for Cycle 1949-1952.*

	YIELDS EXPRESSED AS LBS. MADE TEA PER ACRE			INCREASE IN YIELD OVER UNPROTECTED PLOTS	
	Unprotected	Protected weekly *	Protected fortnightly*	Protected weekly	Protected fortnightly
1st year (23rd May-31st Dec. 1949)	329	414	410	85 (26%)	81 (25%)
2nd year (1st Jan.-31st Dec. 1950)	631	815	778	184 (29%)	147 (23%)
3rd year (1st Jan.-31st Dec. 1951)	829	1058	980	229 (28%)	151 (18%)
4th year (1st Jan.-27th June. 1952)	507	610	589	103 (20%)	82 (16%)
Full Cycle (23 May 1949 - 27th Jun. 1952)	2296	2897	2759	601 (26%)	457 (20%)

* Sprayed with Perenox at a concentration of 4 ounces in 10 gallons of water, at an application rate averaging 12 gallons per acre.

The effect of blister blight was reflected, besides loss of crop, in the production of maintenance foliage and wood. 80 bushes in each treatment were selected on a predetermined plan and pruned to 4 inches above the previous pruning level. Prunings were oven dried and weights of both wood and leaf taken separately. The results are set out in Table II.

Table II. *St. Coombs No. 9 Field Crop Protection Experiment. Wood and foliage determinations of prunings after a 3½ year cycle corrected to pounds per acre on the basis of 3,000 bushes per acre.*

	Unprotected	Protected weekly	Protected fortnightly
Foliage	2827 lbs.	3994 lbs.	416 lbs.
Wood	4308 lbs.	6609 lbs.	6961 lbs.
TOTAL	7135 lbs.	10603 lbs.	11077 lbs.
Gain over unprotected plots		3468 lbs. 49%	3942 lbs. 55%

St. Coombs No. 8 Field Crop Protection Experiment completed 3 years in the cycle at the end of December.

The crop removed from the three plots over a period of three years is shewn in Table III.

Table III. *No. 8 Field Crop Protection Experiment. Crop on Lbs. per acre.*

	Crop	Increase
A. Unprotected	2445	
* B. Protected every 9 or 10 days both monsoons (May - Dec. 31st)	3245	800 (33%)
* C. Protected every 9 - 10 days one monsoon (May - Sept. 9th)	2921	476 (19%)

Fish leaf plucking as an agricultural method of blister blight control has been tried out on a field scale on St. Coombs No. 2 Field for two years. The experiment was described in the Annual Report of the Pathologist for 1951.

Fish leaf plucking and resting were so arranged that the 5½ acre area was fish-leaf plucked during the south west monsoon from May until the end of August, rested with light plucking and spray protection for two months, and again fish-leaf plucked for 4 months from November until the end of February. The resting period, during the dry weather months of March—end of April, was without spray protection.

The cost of fish-leaf plucking was consistently higher than normal plucking while in addition very close supervision of plucking gangs was required to avoid stripping. Irregular growth during the resting period caused considerable difficulty in the formation of new plucking table in a reasonable period of time.

Although fish leaf plucking at a continuous stretch for a few years is known to give high yields in comparison with normal light plucking, which leaves a leaf for the bush, the period of rest necessary to form lost maintenance foliage caused some decline in crop. The loss per acre due to fish leaf plucking and resting in comparison with normal plucking with spray protection was 611 lbs. made tea per acre for the period April 1951 to 31st December, 1952 (21 months). Although fish leaf plucking removes blister susceptible material this type of control is neither economic nor practicable.

Alupolla Estate, Ratnapura, Dusting Experiment. The full results of this experiment were published in the *Tea Quarterly*, Vol. 23, Pt. 3, September, 1952, pp. 76-80. Control with 2 per cent. "Cuprosana" dust was below requirements but adequate control was given with 4 per cent. "Cuprosana" at 5 lbs. every 5 days.

Ury Group, Passara, Dusting Experiment. The results of this experiment are to be published in a 1953 issue of the *Tea Quarterly*.

Pests. Severe outbreaks of a Noctuid caterpillar pest occurred on a Ratnapura Estate, on the shade tree *Peltophorum inerme* syn. *P. ferrugineum* and tea underneath it, during the early months of the year. Specimens sent to the Commonwealth Institute of Entomology were kindly identified as *Selepa spurcata* Walk.

The pest originated on the *Peltophorum* foliage which it attacked exclusively in preference to *Albizzia*, *Gliricidia maculata*, *Derris*, *Indigofera* and *Crotalaria anagyroides* intergrown with *Peltophorum* and tea. After almost complete denuding of leaf of *Peltophorum* the pest migrated to the tea beneath it and caused serious damage to mature foliage.

Albizzias at a later stage of the outbreak were attacked on a small scale.

Peltophorum was grown extensively as a shade tree in tea and had a stand of 60 - 80 trees per acre. By the end of March it was estimated that 250 acres in 3 divisions were infested. The attack was controlled by spraying and dusting with D.D.T.

PASSARA SUB-STATION.

Mr. G. D. Austin reports as follows:—

Staff. The Assistant Pathologist and a field assistant (Mr. C. Marudaveeran) from the Passara Sub-Station were transferred, temporarily, from May to October to Hapugastenne Group, Ratnapura, for the investigations on shot-hole borer. Mr. C. Shanmugam was appointed by Messrs. James Finlay & Co., Ltd., to assist in this work.

Advisory. 464 letters were received and 663 despatched.

Over 50 consignments of insects and pests and diseases were received for examination and report.

Besides Nettle Grubs, the chief insect pests reported were Red Borer (*Zeuzera coffeae* Nietn) in new clearings; Tea Aphis (*Toxoptera aurantii* Boyer) Purple Mite (*Calacarus adornatus* (K)) and Yellow Mite (*Hemitarsonemus latus* (Banks) Ewing) in tea nurseries.

Poria and Brown Root were the chief fungus root diseases sent to the laboratory for identification.

Nettle Grubs. Two species were involved in the 15 outbreaks which occurred in Uva during the year. While *Natada nararia*, the Fringed nettle grub, was responsible for the attacks in the Badulla and Passara planting districts, *Parasa lepida*, the Blue-striped nettle grub, was the species concerned in the Haputale outbreak.

A feature of all the reported outbreaks was the absence of hymenopterous parasites. "Wilt" caused by a granulosus virus disease was responsible for the ultimate control of attacks.

Xyleborus fornicatus Eich. and *X. compactus* Eich. were the only two species recorded during the investigations at Ratnapura. *X. fornicatus* is the commoner species which attacks tea and many of the green manure plants intergrown with tea. *X. compactus*, a smaller, less common beetle, was observed in a new clearing and with *X. fornicatus* in mature tea.,

Nursery plants, supplies, and young tea in clearings are liable to infection when plants are 12 to 18 months old. Very rarely are plants attacked before they are a year old. The early attacks, however, are slight. Severe infestation occurs when plants, which are centered and pruned reach their fourth year from planting and are ready for plucking. Plants that are pegged down (as opposed to centering) are liable to infection when they are 18 to 24 months old.

The presence of borer is usually indicated by die-back shortly after pruning and the presence of broken branches in young and flushing tea. The latter symptom is brought about by strong winds and the movement of labour through the fields.

Destruction of prunings does not contribute to a decrease in the intensity of future attacks. A couple of populated galleries left in the frame of a pruned bush are sufficient to initiate a future attack. This observation corroborates evidence first obtained at Passara a few years ago.

No parasitic or predacious insect was found in the thousands of galleries which were dissected.

The whitish exudation, so frequently found within galleries, and on occasions emanating from entrance holes, and associated with dead beetles and larvae, was found to be a species of saprophytic fungus.

Insecticidal tests were carried out both in the laboratory and the field. The extremely wet weather prevailing, practically right through the investigation was not too favourable for field trials. Of several insecticides tested, Dieldrin and Gammexane P 520 — both water dispersible powders — gave promising results.

Insects in Low-Country Clearings. The following is a list of the more important insects and mites which were recorded. While some are of minor importance others should be considered as potential pests.

1. Red Borer. *Zeuzera coffeae* Nietn., an insect capable of killing a young teaplant and therefore a serious pest in nurseries and new clearing. Damage is frequently attributed to shot-hole borer. The presence of the Red Borer caterpillar within the stem of the plant is detected by the withering or browning of the leaves which remain fixed to the branches and the reddish or yellowish pellets of excreta on the ground close to the affected branch.

Pruning attacked branches is a practical measure of control in destroying larvae and pupae.

2. Lobster Caterpillar. *Strauopus alternus* Walk, though popularly considered an "insect curiosity" is known to have reached the status of a pest on a couple of occasions. In Ratnapura, caterpillars appeared in large numbers, on a few clearings during August and September and caused considerable defoliation. Hand picking and destroying of the caterpillars was found effective and economical. A 50% DDT spray in the proportion of a pound of the powder in 50 gallons water is also useful should estates prefer this method of control. Caterpillars were parasitised by the Tachinid, *Carcelia gnava* Mg.

3. Tea Tortrix. *Homona coffearia* Nietn. was very frequently observed but always ultimately controlled by the imported parasite, *Macrocentrus homonae* Nixon.

4. Red Slug. *Heterusia aedea cingala* Moore. This caterpillar which confines its depredations to mature leaves was rather serious during June and July. A bacterial "wilt" disease and the Tachnid fly, *Zenillia heterusiae* Coq combined to control the pest effectively.

5. Nettle Grubs. *Natada nararia* Moore, *Thosea cervina* Moore and *Thosea recta* Hampsn. all controlled by Braconid parasites, the first two species by *Rogas* and *Fornicia ceylonica* and the last by *Spinaria* sp. appeared right through the six months.

6. Yellow Mite. *Hemitarsonemus latus* (Banks) Ewing was noticeable on the older clearings.

7. Purple Mite. Hitherto known as *Eriophyes (Phytoptus) carinatus* Green, and now identified as *Calacarus adornatus* (K) by Dr. H. H. Keifer Systematic Entomologist—attached to the California Department of Agriculture U.S.A., was observed on mature leaves before the rains set in.

Trace Elements Experiment. This experiment which was laid down by Dr. Haworth in 1951 was brought to a close in March 1952. The treated plots failed to show any response to the "minor nutrients mixture containing all known essential elements" which was applied as a spray 5 weeks before the tea came into tipping. Vide *Tea Quarterly*, Vol. 23, part 3, pages 67-69 (1952).

In view of the fact that the tea in the whole experimental area displayed a fresher and greener appearance than the rest of the field at the end of the Uva drought, it was decided, towards the end of the year, to continue the recording of weekly pluckings from January 1953.

Vegetative Propagation. Selected clonal material received from St. Coombs for trial under Uva conditions, have been established in a series of multiplication plots in the ground of the sub-station. The following are brief notes on some of the clones.

No. 2023—growth satisfactory but very susceptible to Blister Blight.

No. 2024—vigorous grower and apparently resistant to blister blight, and shot hole borer.

No. 2025—first class clone with broad leaves. Resistant to blister blight but very susceptible to shot-hole borer.

No. 2026—growth satisfactory but very susceptible to blister blight and shot-hole borer.

Green Manures and Shade Trees. In addition to many legumes which were established on the demonstration plots on the grounds of the Sub-station the following were grown for the first time.

Aeschynomone Americana L.
Crotalaria spectabilis
Desmodium distortum
Indigofera Teysmanii Mig.
Stylosanthes gracilis
Priotropis cytisoides

Aeschynomone Americana is the “thornless mimosa”. Growth very satisfactory at Passara; was not attacked by insect pests.

Crotalaria spectabilis. No difficulty was met in establishing this new species of *Crotalaria*. Plants reached a height of 4 feet in 5 months when they commenced to produce bright yellow flowers in profusion. Pods were fortunately not attacked by the common caterpillar pest *Argina*. But the flea beetle, *Longitarsus* caused a slight check to early growth. Light dusting with Gammexane D 025 was effective. Seed was supplied to St. Coombs and the Department of Agriculture.

Desmodium distortum. This is a new forage legume to Ceylon. Seed was originally imported from Guatemala by the Department of Agriculture and established in Peradeniya. An interesting note in the *Tropical Agriculturist* Vol. 107 No. 2 P. 114 (1951) states that “this legume was found to be rich in protein by the U.S. Department of Agriculture and to be of great value in feeding poultry”. At Passara, plants—from seed kindly supplied by Dr. Paul of Peradeniya—grew to a height of 4 feet within 5 to 6 months when they commenced to produce rather attractive purplish flowers. Packets of seed from the sub-station were supplied to a few estates in Uva.

Indigofera Teysmanii Mig. On the grounds of the sub-station this green manure tree has not grown so well as it has on some Uva estates. It is recommended by the Ceylon Department of Agriculture, as a light shade for establishment in tea fields susceptible to blister blight.

Stylosanthes gracilis. This cover grows luxuriantly at Passara. Seed and cuttings were supplied to many estates in Uva and Sabaragamuwa. Hare have caused a certain amount of damage.

Priotropis cytisoides, is a new importation by the T.R.I. from Tocklai. There was no difficulty in establishing it at Passara where growth was more successful than at St. Coombs. It is rather a quick grower; plants flowered within 2½ months from germination when they were about six feet tall. With the exception of a couple of instances when shot-hole borer, *Xyleborus fornicatus* bored stems of pencil thickness, the plants were singularly free of insects.

MYCOLOGY

Mr. B. N. Webster reports as follows:—

Staff. The Mycologist, Mr. B. N. Webster, M.A., M.Sc., M.I. Biol. was appointed on August 1st, 1952, and following periods of study at East

Malling, Long Ashton and Rothamsted Research Stations, arrived in Ceylon on December 25th, 1951, taking up duties on January 3rd, 1952.

Mr. H. L. Munasinghe was appointed Technical Assistant on May 1st, 1952.

During the absence of the Pathologist from April 25th to December 1st his duties were carried out by the Mycologist.

Advisory. Apart from the correspondence reported by the Pathologist, 56 advisory visits were made, and many requests for visits had to be refused.

Diseases. No severe outbreaks of previously recorded diseases occurred during the year. In the Dimbula district "Black-rot" caused by *Corticium invisum* Petch was again recorded, and a previously unrecorded disease of *Acacia elata* was noted, and is under investigation. The disease is manifested by severe branch and stem cankers which eventually girdle the affected tree, killing it. Sites of infection would appear to be branch crotches and pruning spurs.

Irpex sub-vinosus Berk. was recorded as causing a root disease of *Acacia sp.* and *Crotalaria agathifolia*. This is the first record of this fungus since 1916.

Control of the "Cerataphorum" disease of *Albizzia spp.* caused by the fungus *Pleiochaeta albizziae* (Petch) Hughes (*Cerataphorum albizziae* Petch) was found to be effected in the nursery by spraying with 50% copper fungicides at a concentration of 6 oz. per 10 gallons of water. A soaking spray should be applied on weekly rounds, or less when the disease is particularly prevalent. Protection from direct rain ("high pandals") would appear to be of some assistance in control.

The tea flush infection (corroded leaf) attributed to the "Cercospora" disease organism (*Calonectria theae* Loos) was very prevalent in the Nuwara Eliya District, and this disease is being re-investigated.

Nursery diseases of seedlings and V.P. plants were troublesome, and a nursery was established at St. Coombs for their investigation.

Pests. The so-called tea mosquito, *Helopeltis theivora* Waterh. was again reported from several estates in the Deniyaya-Rakwana area, where it appears to be endemic. A general circular on recognition and control of this pest was distributed to all estates in the districts affected.

Field Experiments and Trials. Blister Blight. The long term experiments on St. Coombs and elsewhere were maintained, and are reported on by the Pathologist.

In addition the following trials were undertaken:—

Double Nozzle Spraying. Spraying trials with the Boomjet Nozzle OC.02 produced by the American Spraying System Ltd. were carried out on Meddecombra North, Estate with the kind permission of the Manager, Eastern Produce and Estates Company.

Mr. R. Hazell, Superintendent of Meddecombra North, reports as follows:—

"The nozzles were used on two batteries of sprayers, each consisting of 6 knapsacks, one charge pump with two men, and a kangany in charge,

making a total of 16 men with two kanganyes. Spraying began at about 6 a.m. there being no muster for the gangs, and other incentives were afforded such as breaks for tea, priority in contract works when spraying was over etc. in addition to the extra pay of 15 cents per man and 25 cents per kangany.

Two rows were sprayed by each man, the lance being moved in an arc from side to side. Throughout the operation outlet valves were regulated by the spraying labourers to give a reasonably constant output. At the beginning when the pressure was high, the valve was partly closed, and then gradually opened as the pressure dropped. The labourers appeared to understand the reason, and used the device intelligently. Stress was laid upon the necessity for stopping the jet when passing obstacles etc. Water was available in the fields sprayed.

Results. The knapsack emptied in a little over 15 minutes, thus necessitating quite rapid movement in order to avoid applying more than 15 gallons per acre.

Working on maximum effort in a comparative trial 1,200 bushes were covered by the double nozzle in the time taken to cover 700 by a single nozzle.

Averages for the season August-December

Acres sprayed	Labour	Fungicide ozs.	Hours sprayed	Cost per acre	Acres per labr.	Acres per sprayer	Acres per hour
2255	922	13530	451½	Rs. 1.84	2.45	3.30	5.0

In my opinion, with well organised spraying and above all adequate supervision, efficient protection was gained with this nozzle."

Mistblowing. A low volume mistblowing trial with copper fungicide was carried out on St. Coombs Estate during the S.W. Monsoon of 1952.

The prototype apparatus provided by Messrs. Shell Company of Ceylon is described in Mr. van Bommel's report below.

The trial was laid down on St. Coombs No. 8 field crop protection experimental area, for which yield and blister incidence data were available. Plots B (sprayed both monsoons), and C (sprayed S.W. monsoon only), were split, giving a total acreage for mistblowing of 2.73 acres. The remaining halves of the plots were protected by knapsack spraying with Perenox at the normal concentration (4 ozs. in 10 gallons water, at 15 gallons per acre). The mist-blower was used with Shell Company's copper fungicide at a concentration of 6 ozs. fungicide per 1½ gallons water.

Results: Output. Spraying time averaged 2 hours for the 2.73 acres sprayed with the machine, *i.e.* 1.35 acres per hour. The machine emptied after approximately 40-45 minutes, thus covering one acre with every charge of 1½ gallons.

Yield. Being an unreplicated trial yield comparisons are not possible.

Blister Incidence
Percentage of infected flush at each pluck average

A Plot Unsprayed	B Plot Both monsoons		C Plot S. W. monsoon only	
	Knapsack	Mistblower	Knapsack	Mistblower
42.8%	10.4%	14.4%	11.7%	20%

Copper Analysis p.p.m.

	Knapsack	Mistblower
Wet Periods	107	73
Dry Periods	107	111

Protection on the whole was satisfactory, bad blister attacks being localised to patches which had presumably been "shadowed" by resting bushes, extra large bushes etc.

It is felt that an even plucking table is more desirable for this type of protection than even for knapsack spraying.

A large scale trial with this prototype machine was carried out on Kataboola Estate, Kotmale, by Mr. P. van Bommel of the Shell Company. A precis of Mr. van Bommel's report follows:—

"This machine consists of an engine carried on the labourer's back, a fan or blower suspended in front of the labourer on a blower carrier attached to the engine frame, and a spray liquid tank of 1½ gallons capacity carried on the chest. From the engine a flexible drive turns the fan and a pressure take-off from the cylinder pressurises the liquid tank. Spray liquid is fed through a nozzle mounted in the fan housing. Total weight of the machine filled is 42-45 lbs. which compares favourably with a charged knapsack.

Spraying a swathe distance of four rows, always with the wind, output figures have ranged between 1.5 and 2 acres, per hour, per sprayer, depending on the nature of the tea and terrain."

A large scale costing trial using this machine will be laid down in 1953, as costs and labour figures using the prototype machine are necessarily higher than would be the case in normal practice.

Rhizoctonia Solani. This fungus, well known as casual organism of a disease of tea seedlings and only occasionally recorded as a disease of mature tea, was said to have caused attacks of epidemic proportions on mature tea in the Ratnapura area. Heavy defoliation of the lower leaves was said to result.

Accordingly a large scale replicated plot experiment was laid down on recently pruned tea, in an effort to find suitable control measures. The treatments applied have all been found efficacious in the treatment of this disease on other crops, and in other countries. Results are not expected until later in the cycle.

Mycorrhiza of Tea. An investigation into the mycorrhiza of tea was begun during the year as a direct outcome of two observations. One, an observed difference in density of root hairs between young and old tea, and the second certain peculiarities in the nitrogen nutrition of the bush. An endophytic fungus was found in 75% of the roots examined, from a large area of tea. Morphologically it is of the *vesicular-arbuscular* type, and agrees well with the endophyte previously described from Indian tea by Tunstall and Butler, and called by the latter author *Rhizophagus theae* (Zimm.) Butler.

It is undesirable as yet to form any conclusions, or hazard any opinion as to the possible significance of mycorrhiza in tea, but it is hoped that we shall be able to raise plants free of the endophyte and study the effects of various manurial treatments in the presence and absence of mycorrhiza.

REPORT OF THE ENGINEERING DEPARTMENT FOR THE YEAR 1952.

Staff. There were no changes in the staff during the year. The Engineer proceeded to the U.K. on furlough at the end of October and Mr. B. D. Garnier was appointed to act for him.

Workshop. An electric vulcanizing machine was installed for repairs to tubes and tyres of the Institute's vehicles. A tubular steel two bay building with asbestos roofing and cladding was imported in which to carry out the maintenance of vehicles. A motor mechanic will be engaged next year. This extension should show a considerable reduction in present maintenance costs.

Crop Protection. Test work on spraying equipment was carried out again throughout the year and considerable assistance by the workshop was given to Mr. P. M. Van Bommel in connection with his Mist Blowers.

Boomjet nozzles imported from U.S.A. were tested out on Meddecombra (North) Estate by Mr. R. Hazel and the following figures may be of interest:—

Boomjet nozzle No. OC-02
Hours worked—272½
Average acreage sprayed per day 3.44
Application rate per acre—15 gallons
Total cost per acre—Rs. 1/84.

A power unit for charging sprayers drawn by the tractor was completed but working costs are not yet available.

Electrical Installation. Estimates were obtained during the year and work was commenced on the change over from D.C. to A.C. One engine was removed from the Power House and was replaced by an A.C. motor to drive one of the existing 35kW D.C. generators. This unit supplies power for the Factory and Workshop. Re-wiring of Senior and Junior Staff Bungalows was commenced for the A.C. supply and will be finished next year.

The Power House was completely renovated and the equipment re-painted, an electrical store was added to this building and Mr. Garnier is to be congratulated on the very excellent job of work done.

Water Supply. Difficulty was again experienced during the dry weather in maintaining an adequate supply of water to bungalows and quarters.

The reservoir was cleaned and enlarged during the year. A water meter was installed to ensure that the filtration plant worked at maximum efficiency. Estimates were obtained for additional filtration plant, but in view of the high cost of such plant, the matter was left in abeyance for the time.

Buildings. A set of new quarters to house two families was built by the Institute's baas.

Water borne sanitation was installed in two sets of Peon's quarters and the usual maintenance work was carried out on the Institute's buildings.

J. LANDRETH,
Engineer.

REPORT OF THE SCIENTIFIC OFFICER LOW-COUNTRY SUB-STATION FOR THE YEAR 1952.

Staff. Mr. T. E. Walter remained in charge of the station throughout the year, assisted by Mr. F. P. Jayawardene.

I. Vogan Estate. (i) The N.P.K. manurial experiment laid down the previous year was continued.

(ii) A short term minor element experiment was carried out as initiated by the Agricultural Chemist—a mixture of a number of trace elements being applied by means of a foliar spray. No significant difference was found between the treated and untreated plots, thus supporting the evidence obtained from similar experiments carried out in other districts.

II. Vogan Estate, area leased to T.R.I. (a) Vegetative Propagation. (i) All available nursery clonal material of 6 months old and over was planted out in multiplication plots. In spite of the fact that an exceptionally severe drought set in shortly after planting, a high percentage success was obtained from most of the clones. This opportunity should be taken of stressing the fact that V.P. material is only suitable for planting out in the field in the low country if it has a well developed root system, 6-9 months being the average minimum age at which the material is ready for planting out.

The multiplication plots already established were yielding some cuttings by the end of the year, and these were supplemented by further collections from low country estates.

(ii) The opportunity was taken to compare different methods of centering, *viz.* "thumb nail" pruning, bending over, layering and scateuring. Of immediate interest, especially for multiplication purposes, was the very large amount of new growth induced by the layering and bending over processes.

(b) Bush Green Manures and Cover Crops. (i) Routine sowings of these were made on the planted area; the unplanted area was also sown in contour strips with the object of providing a ready-made shade canopy for the following year's planting season.

(ii) Small scale trials. Of the large number of bush green manures tried, *Desmodium gyroides* and *Crotalaria brownei* proved outstanding, the former being better able to withstand lopping.

Amongst the cover crops tried the common indigenous species of *Desmodium* (*D. heterophyllum* and *D. triflorum*) are worthy of mention and should be encouraged in bare areas, though the latter tends to form rather too thick a mat on the surface. *Desmodium ovalifolium* and *Indigofera endecaphylla* can

also be recommended, the former particularly for soil conservation on steep banks.

The really outstanding species, however, in this section was undoubtedly *Stylosanthes gracilis*, (a S. American species recently introduced from Australia). It must, of course be cut back regularly (at least in new clearings) to prevent its prolific growth suppressing the tea, but as its branches merely straggle without taking root, this presents no difficulty. It can be propagated very easily from cuttings, each of which should have three or more nodes. By the end of the year enough material was available to enable us to make a distribution of cuttings to a number of low-country estates.

(c) **Shade Trees.** Of a number of species tried *Indigofera teysmanii* showed promise; it is a very quick growing tree, and gives a light feathery shade.

III. Other Estates. In conjunction with the Plant Physiologist, a long-term pruning experiment designed to find out the optimum length of pruning cycle under low country conditions in an area where *Rhizoctonia* was prevalent was laid down on Ingiriya Estate. Control measures for *Rhizoctonia* were, therefore, superimposed on half the plots, and Mr. B. N. Webster, Mycologist, co-operated.

Our thanks are due to the Management for granting facilities for this experiment, and to the superintendent for his co-operation.

A *Rhizoctonia* control experiment was laid down on Galbodde Estate, in co-operation with Mr. B. N. Webster, Mycologist.

Further shot hole borer experiments were carried out on Galbodde Estate, for which purpose Mr. G. D. Austin (Assistant Pathologist) was transferred there from the Passara Sub-Station for a period of 6 months; apart from these shot-hole borer investigations (to which reference will be made elsewhere in due course) he also supervised the *Rhizoctonia* control experiment on this estate.

Our thanks are due to Messrs. James Finlay & Company and the Superintendent of Galbodde Estate for putting a bungalow at Mr. Austin's disposal, and for providing facilities for these experiments.

IV. General. Meetings of all the low-country District Planters' Associations were attended at one time or another during the year. Two addresses were given on "Drought" (Kegalle District Planters' Association) and "The developments to-date of the Low-Country Sub-Station" (Deniyaya Planters' Association).

T. E. WALTER,

Scientific Officer.

Low Country Sub-Station.

ANNUAL REPORT OF THE SMALL HOLDINGS ADVISORY SERVICE FOR THE YEAR 1952.

General. The new scheme of advisory assistance to small growers in tea, was put into operation during the year. It is naturally too early to attempt an assessment of its value to the small grower in tea.

Staff. The staff for this organisation had to be recruited in batches, in view of the limited accommodation for training both at the Tea Research Institute and the Advisory Headquarters at Peradeniya.

Ten officers have been appointed up to date of whom, the first batch of five officers were recruited on 1st January, 1952, and the remainder appointed as from 1st April, 1952. Appointments were limited to men who held a Diploma in Agriculture or as an alternative, counted considerable experience in tea together with a fair academic record.

Under these circumstances, it was possible to compress their training into 6 weeks of intensive work in field operations at St. Coombs and Peradeniya. In this connection I acknowledge particular indebtedness to Dr. R. M. Gorrie who was most helpful in training these young officers in soil conservation methods. During the period of training at St. Coombs these officers were given every opportunity to study field conditions under the guidance of the Superintendent of St. Coombs, Mr. F. C. Daniel and his assistant Mr. B. Asirvadem.

They also spent a part of their time in the Institute's laboratories to acquaint themselves with laboratory methods of soil analysis, the identification and treatment of diseases and the physiology of plants.

At Peradeniya they were shown round small holdings and instructed in the problems they would be faced with in their day to day work. I wish to place on record my appreciation of the co-operation I received from the Senior Officers of the Small Holdings Advisory Service in training these new entrants for their work.

The full strength of the staff of the Small Holdings Advisory Service, as at present constituted, is as follows:—

- 1 Officer in charge
- 4 Small Holdings Officers
- 10 Instructors
- 1 Cinema Operator-cum-Instructor
- 1 Clerk

Distribution. The present distribution of staff is as follows:—

	<i>Acreage</i>	<i>Officers</i>	<i>Instructors</i>
Central Province	38,000	2	5
Sabaragamuwa Province	15,000	1	2
Southern Province	14,000	1	2
Uva Province	7,300	nil	1
Western Province	1,900	nil	nil

Correspondence. 1,465 letters were received and 2,452 despatched.

Visits and Advisory Work. 6,406 visits were made by officers in the field, for the purpose of carrying out advisory work amongst small holders.

Assistance. A very modest scheme of assistance has been administered by this branch since its inception to make available artificial manure and a good quality of tea seed to small holders at cost price on easy terms of payment. The keener workers have taken advantage of this opportunity and during the period under review $14\frac{1}{2}$ tons of manure and $75\frac{1}{2}$ maunds of tea seed were issued.

Advisory Work. The practice hitherto has been to allot to officers large and scattered areas. With the increase in staff, the working areas of officers have been re-defined with very satisfactory results. More work has been achieved with less travelling during the very short period these officers have been out in the field.

The service is purely advisory and progress must of necessity be slow. The economic condition of the small tea grower being as a rule perilously unstable, he cannot always be relied on to proceed along systematic lines or to work to a regular programme.

This factor is a great disadvantage to both the advisory officer and the small holder. Some few owners of small holdings who do not depend entirely on the income from their holdings have been able to improve their gardens under the guidance of our officers. Such small holders are, however, in a very small minority. Even so they help us considerably by the example they set to the neighbouring small holders.

The majority of small holders work on their holdings when prices are good. They are prepared to carry out our instructions and sometimes make very good progress. This progress, however, is short-lived if there is a fall in prices.

As long as the small holder cannot be assured of a regular price for his leaf, work on the majority of small holdings must suffer. Tea, unlike any other crop, demands constant attention and this is something beyond the small holder unless he is assured of a fair income.

Propaganda Work. A considerable amount of propaganda work has to be carried out before the actual advisory work commences. For this purpose we have a Cinema Unit, which visits the different areas periodically. This has proved most popular and has helped the officers considerably in their work.

66 cinema shows were organized throughout the tea growing areas.

Southern Province	33 shows
Central Province	30 shows
Sabaragamuwa Province	3 shows

Films are borrowed from the United Kingdom and United States Embassies and the Government Information Department. These films, though they were not on the actual subject of tea, have been of considerable educative value in general agricultural practice. I would like very much to offer our very sincere thanks to the Embassies and the Government Information Department for the loan of these films.

Field Days. Field days were organized by the senior officers with the assistance of their tea instructors. Field demonstrations supported by talks are given by our officers on subjects such as contour planting, pruning,

vegetative propagation, green manuring, draining and spraying for the control of blister blight.

Small holders have readily taken part in these discussions and this has helped considerably to clarify in their minds the object of our work. The Tea Propaganda Board has helped to make our field days a success by providing us with a tea caravan and their assistance is most gratefully acknowledged.

Rural Development Societies. We have had the fullest co-operation from several Societies.

Co-operative Societies. There are a few co-operative societies formed to give assistance to the small grower in tea.

The Tea Control Department, since the expansion of the advisory service, has given us every assistance in our work. Every new applicant for a permit to open up new areas in tea is referred to us for advice and guidance on the opening up of new clearings. A permit is granted only after our instructions in this regard have been carried out. This undoubtedly has increased our work, but the change is most welcome, as it gives us the opportunity of directing the cultivation of a plot from the very first stage.

Conference. A conference of the staff of this service was held at Headquarters during the 3rd week in December to review the work done during the year. It was a most useful meeting affording officers the opportunity of exchanging views on several problems.

My thanks are due to the staff for their kind co-operation in the working of this new scheme.

R. L. ILLANKOON

Officer-in-Charge

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The Tea Research Institute of Ceylon

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